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OTTAWA NATURALIST,

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TRANSACTIONS

OF THE

OTTAWA FIELD-NATURALISTS' CLUB,

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1904.

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THE OTTAWA NATURALIST.

VOL. XVIII. OTTAWA, APRIL, 1904. No. 1

THE REPORT OF THE COUNCIL OF THE OTTAWA FIELD-NATURALISTS' CLUB FOR THE YEAR ENDING 15TH MARCH, 1904.

During the year twenty-one ordinary members and one honorary member were added to the Club. The total membership is now 266, composed of 258 ordinary members and eight corresponding.

SOIRÉES.

All the soirées except the last have been held and have proved interesting and profitable; the attendance being up to the average. The full programme was printed in the March number of THE NATURALIST. The first meeting was of special interest, as it was held to celebrate the twenty-fifth anniversary of the founding of the Club. The speakers were all members of the first Council, and each told briefly of some of the many changes that have taken place during the past twenty-five years, and the part the Club has taken in directing and leading scientific thought in the community —a record which fully justifies the Club's right to exist, and one which should command the hearty sympathy and support of all intelligent people.

EXCURSIONS.

Nine sub-excursions were held during the year at which the attendance varied from twenty to two hundred. These excursions were to places in the immediate vicinity of Ottawa and were highly successful. Special attention was given to the forest trees, their mode of growth and the various means of identifying them, especially by the buds. The two general excursions were to Chelsea and Alymer, the former, held the 16th of May, was attended by over three hundred members and friends of the Club,

and altogether was one of the most successful ever held at that beautiful place ; the latter to Aylmer although successful was not so largely attended. These excursions form the most important part of the Club's work. The outings themselves are most healthful and enjoyable, but when to the pleasure of a tramp through the open glade or leafy forest is added an opportunity of observing or learning something of the beauty that abounds in every rock, plant or insect, the outing is doubly beneficial. These excursions give an excellent introduction to Nature Study, about which so much is written at the present time. Full accounts of the localities visited and the work done at these outings have appeared from time to time in THE OTTAWA NATURALIST.

THE OTTAWA NATURALIST.

The seventeenth volume of THE OTTAWA NATURALIST has been completed. It contains twelve numbers of 228 pages with eight plates. The following are some of the papers published in this volume :

Yukon Hepaticæ, by A. W. Evans.

The Nesting of Birds at the Central Experimental Farm, by W. T. Macoun.

Description of a new species of Matheria from the Trenton Limestone at Ottawa, by Dr. J. F. Whiteaves.

The Beetles of the Oregon Beach. by H. F. Wickham.

A Red-shouldered Hawk in Captivity, by Roger T. Hedley.

Curiosity of a Hummingbird, by Dr. C. Guillet.

Moose with Elk Antlers, by Rev. Wm. A. Burman.

Description of a species of Cardioceras from the Crows Nest Coal Fields, by Dr. J. F. Whiteaves.

Nesting of some Canadian Warblers (3rd paper), by Wm. F. Kells.

Hunting for Caterpillars, by Arthur Gibson.

Petrography of some Igneous Rocks of the Kettle River Mining Division, B.C., by L. P. Silver.

Notes on the Nesting Habits of the Brown Creeper and Hudsonian Chickadee, by L. M. Terrill.

My Pet Crows, by L. H. Smith.

Winter Growth of a Water Lily, by Walter S. Odell.

Notes on some Canadian specimens of "Lituites undatus" (2 papers), by Dr. J. F. Whiteaves.

A Robin Story, by Emery Perrin.

The Lower Jaw of Dryptosauras incrassatus (Cope), by Lawrence M. Lambe.

A Weed Worth Growing, by Dr. James Fletcher.

Biological Notes on Canadian species of Viola, by Theo. Holm.

Remarks on some Marsh Dwellers, by L. M. Terrill.

A Woman's Visit to a Peat Bog, by Miss M. McKay Scott.

Our Eagles and Ospreys, by Rev. C. J. Young.

President's Address, by W. T. Macoun.

Some Canadian Antennarias, by Edw. L. Greene.

A Night's Collecting for Moths at Meech Lake, by Arthur Gibson.

Besides several short articles, book reviews, etc.

An important series of articles on Nature Study, edited by Dr. J. Fletcher, have been published each month, beginning with May, 1903. They were written by Dr. James Fletcher, D. A. Campbell, Dr. S. B. Sinclair (2 papers), W. A Dent, A. E. Attwood, Professor W. Lochhead, Dr. G. U. Hay, W. T. Macoun, L. A. DeWolfe, and J. W. Hotson. A large number of copies of each article was printed and distributed to teachers throughout the Dominion. These articles presented Nature Study from various points of view, and have doubtless proved of great value to those interested in the subject. They have proved so popular that a special committee of Council has decided to continue the publishing of these articles.

REPORTS OF BRANCHES.

The Botanical Branch reports as follows :—

"Good work has been done by the Botanical Branch during the past year. Professor J. Macoun, in his official capacity, spent the whole summer in Ottawa and vicinity studying the flora of the district, but especially the fungi for Part VIII of his Catalogue of Canadian Plants. He added over two hundred species to the Ottawa flora. Dr. James Fletcher has continued his studies of violets and has done good work in growing the different species

so that they could be studies at all stages of their growth. Dr. Guillet has continued his phenological observations, and has also made a study of the character of the past two springs as affecting the growth of plants. The studies of Mr. D. A. Campbell in the morphology of plants have also been of much value.

The regular fortnightly meetings of the Botanical Branch held at the homes of the members have proved a great success. These meetings were inaugurated by Dr. James Fletcher, the first one being held at his house on February 5th, 1903. The object of starting them was to keep up and promote an interest in botany among the members, and give an opportunity for the reading of notes and short papers on botanical subjects, and to have a general discussion on any matter which might be brought up by the members. Two meetings were held last year and fourteen this year, making sixteen in all, with an attendance of from ten to thirteen at each meeting. Many interesting subjects were discussed and much information was given. Full reports of nearly all of the meetings have been printed in THE OTTAWA NATURALIST. The following are some of the more important topics discussed. The advisability of sub-dividing the Ottawa district into four areas; What is Nature Study?; Canadian violets; Reasons for the "rosette" arrangements of leaves at the base of some plants at a certain period of their growth; Weeds and the causes that lead to their dispersion; Native plants which compare favorably in appearance and succeed as well as Exotic plants: How to know the edible and poisonous fungi; How to study ferns; Relationship between weather and plant growth—a comparative study of the last two springs; Besides these many other subjects were discussed.

The leaders of the Geological Branch report that no systematic work has been carried on during the past year in the vicinity of Ottawa. Leaders in this branch, however, attended the excursions and assisted as far as possible in explaining the Geological problems presented by the different localities visited. It was noted with pleasure that a larger number than formerly joined the Geological section on these occasions.

The members of the Entomological Branch, although few in number, have been very active during the past year. The regular

fortnightly meetings mentioned in last year's report were kept up during last spring and the present winter. Several interesting papers were read and considerable enthusiasm was engendered among the members of the Club. There has been a renewed activity in collecting and studying the insects of the Ottawa district, and good work has also been done by outside members. Mr. W. Metcalfe has taken up and made good progress in studying the local Hemiptera, many of which have been identified by Mr. Van Duzee. The Rev. G. W. Taylor, of Wellington, B.C., has amassed one of the best reference collections of the Geometridæ of North America, and has rendered great assistance in identifying specimens for collectors. The leaders have all been exceptionally active and large additions have been made to the local lists of insects.

The Ornithological Branch report that the leaders attended the excursions and pointed out the chief characteristics of the birds seen and aided those interested wherever possible, and also that through the help of the Hon. Frank Latchford arrangements have been made for the appointment of a special official to enforce the Provincial Act which prohibits the destruction or trapping of useful birds.

The Treasurer's Report shows a balance on hand of $39.18.

The thanks of the Council are again heartily extended to Principal White, of the Normal School, for the use of rooms in this building in which we have held all our soirées, and also for the continued use of a room for our library, and Council meetings. The Council again wishes to place on record its obligations to the daily press of this city for publishing notices of our meeting free of charge.

W. J. WILSON,
Secretary.

THE OTTAWA FIELD-NATURALISTS' CLUB.

The Treasurer's Statement for the year ending 15 March, 1904.

RECEIPTS.		EXPENDITURE.		
Balance from previous year..	$41 73	Printing OTTAWA NATURALIST, Vol. XVII 12 nos., 228 pp.....	$286 20	
Subscriptions, 1903-04 .. $149		Illustrations	38 62	
Arrears..... 76		Authors' Extras.....	29 55	
——	225 00	Nature Study Leaflets	22 00	
Advertisements	42 40	Miscellaneous printing: Wrappers, Post cards, etc....	25 00	
Authors' Extras sold	27 95		401 37	
OTTAWA NATURALISTS sold..	20	Postage	21 45	
Maps of Ottawa sold... ...	50	Editor	50 00	
Government Grant..... ...	200 00		472 82	
		Less 5% for cash on printers' account...	19 86	
			——	452 96
		Soirée expenses		32 50
		Sundry expenses, postage, etc		13 14
		Balance.....		39 18
	$537 78			$537 78

Examined and found correct.

R. B. WHYTE,
J. BALLANTYNE, } *Auditors.*

ARTHUR GIBSON,
Treasurer.

The Treasurer begs to remind the members of the Club that their subscriptions are payable in advance, at the beginning, not at the end, of the Club year. A great many, he regrets to say, have allowed themselves to get into the habit of not paying their subscriptions until the receipt of a special appeal asking for funds. Members who have not paid their subscriptions for the current year—March, 1904, to March, 1905,—will oblige the Treasurer very much by sending them in as soon as possible. The expenses of the Club in connection with the printing of THE OTTAWA NATURALIST, etc., have to be met from month to month, and it is the wish of the Council that these be paid promptly.

THE CANADIAN SPECIES OF TROCHOLITES.

By J. F. WHITEAVES.

From the dismemberment and reconstruction of so many of the older genera of nautiloid shells of the Cambro-Silurian and Silurian rocks, which the progress of modern research has necessitated, the genus *Trocholites* has emerged unscathed.

First described by Conrad in 1838 and again in 1842, it has since been studied, described more fully, and illustrated, by Hall, Foord, Schröder, Holm and Hyatt.

The original description of the genus in 1838, on page 118 of the Second Annual Geological Report of the State of New York, is as follows : "Shell in the form of an Ammonite ; volutions contiguous, gradually increasing in diameter ; septa plain." And, the additional definition of the genus, in 1842, on page 274 of the eighth volume of the Journal of the Academy of Natural Sciences of Philadelphia, is in these words : "Involute ; symmetrical ; whirls contiguous ; the back of inner volutions rounded, fitting into a corresponding groove ; septa convex ; siphuncle near the inner margin." "This genus," Conrad adds, "differs from *Lituites* in having a submarginal siphuncle, and in not being extended into a straight or bent prolongation. The aperture is widely different, being of a lunate outline, whilst in *Lituites* it is nearly round." As now understood, shells of the genus *Trocholites* may be roughly described as small nautilicones, with slender whorls that are compressed on the venter and dorsum and expanded at the sides, their outline in cross section being usually reniform. The surface markings consist of small flexuous transverse ribs, ridges or striæ, often accompanied with spiral raised lines. The sutures of the septa are also flexuous ; the siphuncle of the adult shell is placed near the dorsum, or at least on the inner side of the centre ; and the chamber of habitation occupies from rather less than one-half to about three-quarters of the outer volution.

In the Guelph formation of Ontario there is a fossil that seems to be identical with the *Lituites multicostatus* of Whitfield (1882) which Hyatt says is synonymous with the *L. Graftonensis* of Meek and Worthen (1870), though it does not belong to the genus

Lituites, as now restricted, nor even to the Family Lituitidæ. This fossil was referred to *Trocholites* by the writer in 1884, and to *Discoceras*, Barrande, by Hyatt in 1894, who, however, admits the "close connection" between these two genera, and, in his latest publication,* includes both of them in his Family Trocholitidæ. It is still perhaps doubtful whether this Guelph species is a *Trocholites* or a *Discoceras*, but in the Cambro-Silurian rocks of Quebec and Ontario there are now known to be at least three undoubted and well marked species of *Trocholites*, upon which the following notes are submitted.

TROCHOLITES AMMONIUS, Conrad.

Trocholites ammonius, Conrad. 1838. Second Ann. Geol. Rep. St. N. York, p. 119.

,, ,, Emmons. 1842. Geol. New York, pt. II, p. 279, fig. 3; and p. 392, fig. 1.

Utica trocholite, Vanuxem. 1842. Geol. New York, pt. III, p. 57, fig. 3.

Trocholites ammonius, Hall. 1847. Pal. New York, vol. I, p. 192, pl. XL, A, figs. 4, *a—k*.

,, ,, Emmons. 1855. Amer. Geology, p. 146, fig. 29, and pl. XII, figs. 14, *a—d*, and 15.

,, ,, Ami. 1888. Canad. Rec. Sc., vol. III, no. 2, p. 105.

,, ,, Foord. 1891. Cat. Foss. Cephal. Brit. Mus., pt. II, p. 47.

,, ,, Hyatt. 1894. Phylogeny of an Acquired Characteristic, in Proc. Amer. Phil. Soc, vol. XXXII, no. 143, p. 486.

This species, which is the type of the genus, seems to be well characterized by its "very peculiar, rough, fretted surface" or "cuticular corrugations," that have been minutely described by Hall and Hyatt. Hall says that "this shell occupies a central position in the Trenton limestone" (of the State of New York) "being unknown in the lower part, but passing upwards into the Utica slate, where it is of less frequent occurrence."

So far, in Canada, *T. ammonius* has been found only in the Utica slate or shale. In 1878, Mr. Walter R. Billings showed the

* The article *Cephalopoda* in Eastman's translation of Zittel's Text-book of Palæontology.

writer specimens of it, that he (Mr. Billings) had recently found in the Government House grounds at Ottawa. But, it was not until ten years after this that Dr. H. M. Ami recorded the discovery and recognition of the species in Canada; at Ottawa in the second volume of this journal, and at Murray Bay, Whitby and Collingwood in the third volume of the "Canadian Record of Science."

TROCHOLITES PLANORBIFORMIS, Conrad.

Trocholites planorbiformis, Conrad. 1842. Journ. Acad. Nat. Sci. Philad., vol. VIII, pt. 2, p. 274, pl. XVII, fig. 1.

" " Hall. 1847. Pal. New York, vol. I, p. 310, pl. LXXXIV, figs. 3, *a—f*.

"Volutions higher than wide, longitudinally striated, and with oblique obtuse, transverse lines, approaching at an angle but rounded on the centre of the back; apex profoundly depressed; back of the large volution flattened; aperture much longer than wide. *Locality.* Near Grimsby, Upper Canada, in Salmon River sandstone. This elegant shell was found in a boulder, by Mr. S. Ashmead, of this city" (Philadelphia) "and by him presented to the Academy of Natural Sciences. A specimen was kindly given me by this liberal and enterprising mineralogist" (Conrad. In addition to this, Hall says that the surface of this species is "marked by obliquely transverse ridges, which bend backwards, forming a broad curve on the dorsal line, longitudinally striated with rounded lines." And, in specimens of *T. ammonius*, from the Trenton limestone, he says that he has "rarely found the transverse and longitudinal ridges so strongly marked."

So far as the writer is aware, no other specimens of *T. planorbiformis* than the two types from Grimsby have been found in Canada, as the fossils from Montmorenci or Montmorency Falls and Lorette that Dr. Foord identified with that species in 1891, prove to be referable to the since described *T. Canadensis*, Hyatt.

Hall, in 1847, describes *T. planorbiformis* as one of the fossils of the Hudson River (Lorraine) formation of the State of New York, and his successor, Dr. John M. Clarke, in 1903, in his "Classification of the New York series of geological formations,"

says that "Salmon River" is an early term applied to the local development of the Lorraine beds in New York. So that both in Canada and the United States this species seems to occur at a geological horizon immediately above the Utica shale.

TROCHOLITES CANADENSIS, Hyatt.

Lituites (*Trocholites*) *ammoneus*, Salter. 1853. Quart. Journ. Geol. Soc. London, vol. IX, p. 86; but not *Trocholites ammonius*, Conrad, 1838.

Trocholites planorbiformis, Foord. 1891. Cat. Foss. Cephal. Brit. Mus., pt. II; but not of Conrad (1842) nor of Hall (1847).

Trocholites Canadensis, Hyatt. 1894. Phylogeny of an Acquired Characteristic, in Proc. Amer. Philos. Soc., vol. XXXII, p. 486, pl. IV, figs. 23 and 24; and pl. VI, figs. 39 and 40.

"Loc., Falls of Montmorency, near Quebec.

"The four specimens representing this species" (*T. Canadensis*) "came from the Bronn collection. They are similar to *T. ammonius* in form, but differ in being broader proportionately in the transverse diameters of the whorls and have deeper umbilici. The whorls are rounded, there being no tendency to angularity, either of the sides or abdomen, and in these specimens the size is small. There are fold-like costæ from an early neanic state, and the living chamber may be considerably over one-half of a volution in length. The exterior is marked by longitudinal lines along the venter and often on the sides, but these have none of the regularity and prominence observable in Conrad's figure, and that figure shows no costations which are more prominent and fold-like in this than in *T. ammonius* or any other described species of *Trocholites*" (Hyatt). These specimens, it may be added, belong to the Museum of Comparative Zoology at Cambridge, Mass.

In 1901 Dr. H. M. Ami collected some interesting fossils from the Trenton limestone at the Natural Steps, a little above the Falls of Montmorency, and among them there are five good specimens of a species of *Trocholites*, which have recently been studied by the writer. They prove to be well preserved and very characteristic examples of *T. Canadensis*, and are in all respects essentially similar to the types of that species, which have been kindly lent to the writer, for comparison, by Dr. W. Y. M. Wood-

worth, the Curator of the Cambridge Museum. And, a study of the original types of *T. Canadensis* and of the similar specimens collected by Dr. Ami, has necessitated the conclusion that the fossils collected by Dr. Bigsby in 1822 at Montmorency Falls and at Lorette, which Salter referred to "*Lituites* (*Trocholites*) *ammoneus*" and Foord to *Trocholites planorbiformis*, are also identical with *T. Canadensis*.

To test the correctness of this conclusion, two of the best specimens of *T. Canadensis* that Dr. Ami obtained at the Natural Steps, were sent by the writer early in January last, to Mr. G. F. Crick, of the British Museum (Natural History), for comparison with the presumably similar specimens collected by Dr. Bigsby, in that Museum. In reply to this communication, Mr. Crick thus writes, in a letter dated January 22nd, 1904: "I have carefully examined the specimens in this Museum to which you refer and am quite satisfied that they are specifically identical with the examples of *Trocholites Canadensis*, Hyatt, that you have sent for comparison. The following particulars about the specimens here may be of interest to you. This Museum contains five examples from Montmorency and two from Lorette, that Dr. Foord (Cat. Fossil Cephal. Brit. Mus., pt. II, p. 49) referred to *Trocholites planorbiformis*, Conrad. The two specimens from Lorette (No. 26568) were presented to the Museum by Dr. Bigsby. The five Montmorency specimens are among the foreign collections transferred from the Museum of Practical Geology. Four of these (c. 4105, *a—d*) were presented to that Museum by Dr. Bigsby, but how the other specimen (c. 4106) was obtained is unrecorded; it bears an original label 'near Montmorenci Falls, near Quebec.'" In a later letter Mr. Crick adds that it would seem that Dr. Bigsby presented examples of the species both to the British Museum and also to the Museum of Practical Geology in 1851.

Professor Hyatt did not state at what particular geological horizon his *T. Canadensis* occurs. But the limestone at and near Montmorency Falls, and at Lorette, is distinctly stated to be Trenton by Dr. Bigsby in 1853,* and by Dr. R. W. Ells in 1889.†

* Quart. Journ. Geol. Soc. London, vol. IX, pp. 84—86.

† Geol. and Nat. Hist. Surv. Canada, Ann. Rep., N.S., vol. III, pt. 2, pp. 22K, and 19K.

The writer has seen no specimens of *T. Canadensis* from Lorette, but if, as seems possible, it there occurs associated with *Plectoceras Halli*, then the horizon of both of these species at that locality may be that of the Trenton rather than that of the Black River limestone.

In Canada it would seem that *Trocholites Canadensis* is characteristic of the Trenton limestone, perhaps of its lower beds, and considerably below the Utica ; *T. ammonius* of the Utica shale ; and *T. planorbiformis* of the Hudson River or Lorraine formation, above the Utica.

Ottawa, March 15th, 1904.

MOLLUSCA NEW TO THE CANADIAN FAUNA.

While staying at Oxley, Ontario, in the fall of 1903, Miss Mary E. Walker, of Buffalo, N.Y., made a collection of the mollusks found there, which was submitted to me for examination. Among them were two species, which, so far as I have been able to ascertain, have not hitherto been recorded from Canada.

1st.—VALLONIA PARVULA, Sterki.

This is a well marked species, easily distinguished from *V. costata* by its smaller size, more depressed form and wider umbilicus. Originally described from the Western States, it was found by myself several years ago at Put-in-Bay. Its discovery at Oxley extends its range still further north. The occurrence of this species at two localities so near together, and so far away from its normal range, with no known record of its having been found in the intervening region, is a curious fact in distribution, and one not easily accounted for.

2nd.—PISIDIUM DANIELSI, Sterki.

This is a new species described by Dr. Sterki in the "Nautilus" for August, 1903, (Vol. xvii, p. 42) from specimens collected in Steuben County, Indiana. Its discovery at Oxley is the first record of its occurrence at any other than the type locality.

BRYANT WALKER.

WARBLER SONGS AND NOTES.

By REV. G. EIFRIG.

Now that the crows, the vanguard of the annual bird migration from the south, have arrived, and two or three bluebirds even have coyly appeared in a sort of tentative way, to see whether winter would not soon disappear in earnest, we may reasonably expect to soon see larger divisions of the great bird-army. In April the sinister companies and battalions of the blackbirds often make themselves apparent even to the casual observer, the purple and rusty grackles with their discordant gurgling, and the fine redwinged blackbirds with their martial *congarée*. Besides these some larger birds, which however do not make themselves so apparent, will then come, some herons and hawks ; also the little trusty phœbe with the plaintive note from which its name is derived. And then comes glorious May, which brings surprises and joys each day in the animal and vegetable kingdoms. Then huge waves of warblers, finches, thrushes, vireos or greenlets, plovers, etc., arrive daily. Then is the time for every one who can, naturalist, professional, amateur or otherwise, lovers of nature and the beauties of it, to arm themselves with an opera glass and lens, and note book, and see, observe, behold and drink in as it were the beauties and lessons and mysteries that nature holds up to our raptured vision. Some of the finest and most interesting objects that we then can and ought to become acquainted with are the birds. Watch them with or without glass, try to impress their chief characteristics on your mind, and if you do not know the bird and are a beginner in bird-craft, look up at home your Bird Neighbors, or some other popular book on birds, and see what the bird you did not know was. And the more you learn thus by your own exertion, which is at the same time pleasure, also healthful to a degree, the more you want to learn and find out ; the love of it will grow on you.

After knowing the birds by their color, size, etc., a person should try to attain some proficiency in recognizing them by their songs and other notes. Of course, if all the birds would announce their names as plainly as the chickadee, or the phœbe or bobolink, this would be comparatively easy. However, this is not the case,

and therefore, it takes more or less patient observation to be able to tell them by their notes.

Some of our prettiest, but at the same time smallest and most elusive birds are the warblers. On some days the open woods are full of them. They are abundant and pretty, yet most people never see them, even if they are at home in their orchards, because they are so small and restless, always moving about. Most of them are so beautifully and conspicuously marked, that if a person once knows when and where to look for them he can readily become acquainted with them. But it takes much patience and stretching and twisting of necks to accomplish it. Therefore, I soon after undertaking it came to the conclusion that it would be advantageous to be able to recognize a warbler by its song or rather lisping—for that is in many cases all, despite their name as a class—that their musical efforts amount to. And to aid nature and bird lovers to learn to know and identify warblers is the *raison d'etre* of this article.

When I heard a warbler song I did not know, I followed up its owner until I positively identified him, then I tried what syllables would reproduce the impression best, and these I jotted down in my note book on the spot. These first impressions sometimes have to be corrected later on, often the first is as good as the last. This I would advise everybody to do who would learn to know the birds by their song.

The following list is loosely arranged according to the time of appearance of the different species at Ottawa, and to the degree of frequency in which they are generally seen.

BLACK AND WHITE CREEPING WARBLER, *Mniotilta varia.* To be seen in open woods of deciduous trees, creeping around limbs and trunk of trees, not high up; color as implied by name. Song insignificant, a repetition of the syllable *sweet.* One I heard sang: *Switta, switta, switt.* One writer gives its song, *Weachy, weachy, weachy, twee, twee, twee, tweet.*

YELLOW WARBLER, *Dendroica aestiva.* This common warbler is entirely yellow, the male having narrow reddish stripes on the lower side, which are apparent only at a near view. This is a bird not so much of the woods as of the open, frequenting trees in fields, along fences and even in cities, where it also nests. Its

song is, *Sweet, sweet, sweet, sweet, sweeter, sweeter*, or *Sweet, sweet, sweetie*, or *Weeche, chee, chee, churwee*, as Prof. Lynds Jones gives it.

REDSTART, *Setophaga ruticilla.* This pretty feathered bit of energy and restlessness can be easily recognized by its conspicuous salmon red with black, which it always displays fully. Its note is not so distinctive; I could never formulate it in syllables to give satisfaction; it is much like that of the preceding two species. Mr. Chapman gives it *Ching, ching, chee, ser-wee, swee, swee-e-e.*

CHESTNUT-SIDED WARBLER, *Dendroica pensylvanica.* The adults of this species are easily told by the chestnut stripe on sides and bright yellow crown. They frequent second growth deciduous woods; they nest low. Song: *Peary, peary, peé-a*, rather subdued. Miss Roberts gives it, *Tsee, tsee, tsee, happy to meet you.*

OVENBIRD, *Seiurus aurocapillus.* Abundant in open woods, *walking* on the ground looking for ants. Its common song with which it greets intruders in its domain is exactly rendered by Mr. Burrough's transcription: teacher, *teacher*, TEACHER, TEACHER, **TEACHER**. Some however, seem to put the accent on the second syllable, or at least many hear it that way, some like *te cheé*, etc.

MARYLAND YELLOWTHROAT, *Geothlypis trichas.* This cheerful and nimble little sprite can easily be identified by its markings as well as by its song. It is bright yellow on breast and head, except a black band on cheeks, ear coverts and forehead. Its song plainly is: *Witchety, witchety, witchety*; accent on first syllable. It frequents bushes and prefers swampy or at least wet situations.

YELLOW-RUMP WARBLER, MYRTLE WARBLER, *Dendroica coronata.* Has four yellow patches on crown, at shoulders and on rump, otherwise bluish-gray, streaked with black. Not much given to song; one author gives it, *Twhip twéeter, twéeter.*

BLACK-THROATED GREEN WARBLER, *Dendroica virens.* Its colors are indicated by the name, yellow on under side. Its song, if once heard well, can not easily be forgotten. It is: *Dee-dee, dée, ah-di.* It is loud, ringing, cheerful. Prof. Jones has heard it this way, *Pe te, che-o te.*

BLACK-THROATED BLUE WARBLER, *Dendroica caerulescens.* Where the preceding one is found, this one may also be looked for. They frequent bushy, open woods and are mostly seen in the branches of medium sized trees. Its best song is ; *Dill-dill dill-dreé*, rapid, ascending. When busy feeding or later in summer it abbreviates this into, *Re-dereé-di*, *Tsree tsree tsree*, or even a shrill, whistle-like, *Trree.*

MAGNOLIA WARBLER, *Dendroica maculosa.* This handsome black and yellow warbler has quite a repertoire of lays and ditties, which all however do not amount to much. Its best performance is a loud, impulsive, *Iree dereé di.* At other times it sings like the Chestnut-sided warbler: *Peary, peary pee a;* then again monotonously: *Tsee, tsee, tsee*, etc., or it utters a rather melodious disyllable *Tsee-wit, tsee-wit.*

BLACKBURNIAN WARBLER, *Dendroica blackburniæ.* This winged gem of black, white and deep orange sings little and then very poorly, a faint. hesitating, *Dee dee dee*, in one pitch of tone, or even only : *De de de.*

PINE WARBLER, *Dendroica vigorsii.* True to its name, this warbler lives only in pine-woods or in single pines amongst deciduous trees. Its color is dull olive and the song exactly like that of the Chipping Sparrow ; it cannot well be reproduced by syllables.

CANADIAN WARBLER, *Wilsonia canadensis.* This warbler is of a somewhat pensive and retiring disposition. It prefers swampy and bushy places. The breast is bright yellow, with a neck-lace of black spots, back bluish gray. The only song I have heard sounds like a faint imitation of the Maryland Yellow throat, a subdued, halting : *Witchety, witchety.* When alarmed in their quiet haunts they utter a sharp *tsip* or *tsink.*

BLACKPOLL WARBLER, *Dendroica striata.* Black and white, with a black crown, larger than most warblers, Its song is a very insignificant dry : *De de de*, uttered very leisurely.

NASHVILLE WARBLER. *Helminthophila ruficapilla.* A bright yellow warbler, bluish gray on top. The song is variable. Some give it : *Wee-see, wee-see, wit-a-wit-wit ;* others : *Ke-tse, ke-tse, ke-tse, chip-ee-chip-ee-chip.* Rather loud and lively.

BAY-BREASTED WARBLER. *Dendroica castanea.* A migrant only here. Song just like that of the redstart.

TENNESSEE WARBLER. *Helminthophila peregrina.* Song like that of the chipping sparrow, except first two syllables, which are *twip* instead of *chip.*

CAPE MAY WARBLER. *Dendroica tigrina.* Rather rare migrant and rather quiet too. Song something like black and white creeper: *awit, awit, awit, awit, awit,* as Prof. Butler puts it.

PARULA WARBLER, Blue Yellow-back Warbler. *Compsothlypis americana.* "Parula's song is hardly wiry, but it is fine and delicate —more like hair than wire. The more delicate singers seem to say, *Pe-tse, pe-tse, pe see see,* or: *cher-re-re, cher-re-re, cher-re-re.*'

PALM WARBLER, *Dendroica palmarum.* Song: *Tsee, tsee, tsee, tsee,* with a distinct swell. (Prof. Jones).

YELLOW PALM WARBLER. *Dendroica palm hypochrysea.* Like preceding.

MOURNING WARBLER. *Geothlypis philadelphia.* Song: *Tee te-o, te-o, te-o, we-se,* or: *True, true, true, true too.*

WILSON'S WARBLER. *Wilsonia pusilla.* Song like yellow warbler or redstart.

Ottawa, March 28, 1904.

HUGE PUFF-BALLS.—Mr. J. Smith of the Topographical Surveys Branch, found a very remarkable puff-ball (*Lycoperdon gigantum*), about a mile from Breckenbridge Station, on the Pontiac and Pacific Railway, on the 25th of August, 1903. It measured 56 inches horizontal girth, and 44 inches vertical girth, a perfect specimen with skin as white and smooth as a piece of kid. There were five other large ones within a few feet of it, some of them decayed, others not fully grown. Mr. Smith has seen large puff-balls at the same place for several years back. Such specimens are not rare about Ottawa, but it is believed that that found by Mr. Smith is the largest ever seen in this district.

JOHN MACOUN.

THE EVENING GROSBEAK.

(Cocothraustes vespertina.)

By C. J. YOUNG.

The readers of THE OTTAWA NATURALIST who are interested to any extent in our birds, will learn with interest that a migration of evening grosbeaks has occurred this winter in Ontario. This bird always creates an amount of interest, partly by reason of its rarity and beautiful plumage, and partly because its summer home and breeding habits are still but imperfectly known.

It visits Ontario at long intervals; this year it has been seen in pairs and small flocks in the neighborhood of Kingston, Ont.,—even within the city limits. A beautiful male was procured by Mr. E. Beaupré on Feb. 23rd, which I saw in the flesh shortly after it was shot. A pair was secured out of a flock at Cataraqui during the same week, and birds had been observed at Williamsville during January. In each case they were feeding on the seeds of the Manitoba maple (*Negundo aceroides*), a tree that only of late years has assumed sufficient proportions in Ontario to bear fruit. It will be interesting to learn whether this bird has been observed elsewhere in Ontario during the present winter.

The evening grosbeak is a rare bird everywhere, though of more frequent occurrence in the west than in the east. It was first described by Mr. William Cooper, of New York, from a specimen obtained by Mr. Schoolcraft near Sault Ste. Marie in April, 1823. The next specimen recorded was obtained in the month of August in the same year by Major Delafield, north-west from Lake Superior. From that time to the present the bird has been occasionally recorded in Canada, but as far as I know there is no record of the discovery of the nest except from the United States.

Accerding to the late Mr. McIlwraith, of Hamilton, Ont., the first report of its appearance in the settled parts of Ontario was in the year 1866, when in the month of May two were obtained by the late Dr. T. J. Cottle at Woodstock. The next record was in 1871, when they were observed in the spring near London, Ont.

Then in March, 1883, Mr. McIlwraith himself saw two near West Flamboro.

The largest migration seems to have been in 1890, when they were frequent about Kingston and elsewhere, and a flock was noticed as far east as Quebec. Again in 1896 two were seen at Kingston. Then none until the present year, 1904, when, during January and February, they have been observed and obtained about Kingston. This completes the record for Ontario to date.

With regard to the nest of the bird and its breeding habits, the honor of discovering it rests with Mr. Jno. Swinbourne, of Springerville, Arizona, who found it on 5th June, 1884, in a canon 7,000 feet above sea level. (*Vide* Auk, vol. v, p. 113.) The next nest was recorded by Mr. W. E. Byrant, as taken by a Mr. Fiske, of the U. S. Geol. Sur. on a hill-side in Yolo Co., Cal., in 1887. The third and last record I can find was a nest and four eggs collected by Mr R. H Beck in the Sierra Nevada Mts., in 1896, a beautiful colored plate of which is published as a supplement in the Nidologist, Sep. 1896, vol. IV, No. 1.

NOTE.—Mr. Edwin Beauprè has sent for publication in THE NATURALIST his notes on the occurrence of the evening grosbeak, The substance of these notes has been embodied in Mr. Young's article above, but Mr. Beaupré says further: "The two flocks that visited the city spent their time feeding on the fruit of Manitoba maple. Locally, this winter's visitation makes the third record since 1890. From the 22nd to the 25th I saw them each day; one evening when I visited the street on which the maples are growing, I found three richly colored males whose striking plumage of white, yellow and black, brightened by the departing rays of the wintry sunset, seemed entirely out of contrast with their surroundings of bleached and withered fruit on which they were sumptuously feasting.

NATURE STUDY—No. XII.

SCHOOL GARDENS IN GREAT CITIES.

(Report of Committee on Industrial Training submitted to the Public Education Association of Philadelphia.)

Facing the Hudson, on the west side of New York City, is a piece of condemned land awaiting improvement, ironically called DeWitt Park. The most vivid imagination could not have conceived a more desolate spot than this was in the summer of 1902. Approached from the east through filthy streets, crowded with noisy, dirty urchins, it loomed up a dark blot on the beautiful background of cool river, green hills and blue sky. Rows of tumble-down houses, disused carts, piles of rubbish, stones, rags and litter, among which the children played, made even the streets seem neat and orderly by comparison.

In the centre of this plot of ground it was evident that something of more than ordinary importance was occurring. The air was black with flying missiles, while excited groups of children ran hither and thither. To all enquiries came the reply, "We are getting ready for our farm." The idea of a farm in that unfavorable spot might have made the inquirer slightly skeptical, but had he stayed to see, the changes wrought were little short of marvellous. The children's ready hands, assisted by older brothers and sisters, and by workmen from the Park Department of Manhattan, accomplished wonders. Stones and rubbish vanished, the hard earth yielded to the plow and harrow. Load after load of rich loam was bought. A fence enclosed the selected space. Walks were laid out, and plots marked, and after days of earnest work the "farm" was ready to receive the seed.

Twenty-five children filed in at the gate and received a practical lesson in planting from the gardener. Teachers meanwhile registered names and properly tagged each "farmer." These tags, upon each of which the name of the child and the number of the plot assigned were registered, were certificates of ownership to be presented at the gate as a pass to enter. The lesson over, the children marched to their respective plots and planted the seeds given to them as they had been shown how to do by the

gardener. New groups followed them, and soon in that desert waste rose an oasis of living green, orderly, neat and picturesque —the first Children's School Farm in New York City.

One hundred and twenty-five farmers cared for their plots during the first season, but in the following spring so many requests for "farms" were received that the Park authorities decided to enlarge the space allotted, so that nearly three hundred boy and girl farmers, varying in age from eight to eighteen years, were happily employed during the summer of 1903. Through the long hot days of July and August you might see them watering, weeding, hoeing, or quietly sitting around the central flower plot listening to a Nature Study talk by the attendant teacher.

Improvements upon the surrounding land followed rapidly in the wake of those upon the farm. Toward the east, the Park Department had placed a huge open air gymnasium and playground. Toward the west, a tiny country seat, with a 12 by 18 ft. farm-house. A green lawn and flower beds, a pavilion, a pig-pen and a chicken house had been added to the farm property. Still further west stood a sand tent, and a second canvas formed a resting place for tired mothers. A typical afternoon might have shown eighty or a hundred children busy in the gardens; in the pavilion a sewing class and a group weaving baskets for farm produce; in the tiny house tea being served by neatly aproned housekeepers; while on the lawn the boys played croquet. During September groups of children from neighboring kindergartens flitted through the garden in the mornings, while the proud owners appeared when school hours were over, basket or bag in hand, ready to carry home their harvest, and spade over their plots, leaving them clean and neat, prepared to defy winter's coldest blast.

As order emerged out of chaos, as stones and rubbish disappeared, the restless, careless horde of children grew daily more quiet and gentle. The wilderness that blossomed as the rose was not only the oasis in the desolate waste of ground, but also in the hardened little lives, now softened by God's wholesome sunshine, in the careless hands that grew so tender with the delicate blossoms, the wayward feet that learned to run the narrow paths

without swerving to the right or left, the half opened eyes, before seeing naught but the factories around, now dimly descrying the Hudson and the light on the hills beyond.

The history of the making of the New York Garden is that of gardens in many cities. Back yards are no longer unsightly. In some cases the stone flagging of the school yard has given place to miniature gardens of great beauty. Historically, gardens for instruction have been an educational factor for many centuries. Nearly 2500 years ago Persian boys received instructions in agriculture and horticulture, in gardens set apart for that purpose. Through the middle ages gardens for educational purposes existed throughout Central Europe. The first definite movement toward establishing *school* gardens was made in Australia in 1869, when a law was passed instituting gardens in connection with all schools in country districts.

In *school* gardens must lie the main interest of those who believe that the public schools are the basis of national character. Statistics upon this subject are difficult to obtain, but an idea of the extent to which this branch of education is carried in European countries may be obtained from the following statement. In Austria there are no less than eight thousand school gardens, in Sweden two thousand and sixteen, while in France practical gardening is taught in 2,800 primary and elementary schools.

America has only begun to realize her opportunity in the value of school gardens as an educational force among the thousands of children in her crowded cities. An effort is being made to attract the attention of educators to the "Model School Garden" which, directed by Mr. Hemenway of the Hartford School of Horticulture, will be a most attractive feature of the World's Fair at St. Louis.

If the Public Education Association of Philadelphia succeeds in its effort to have at least one school garden opened in the summer of 1904, the garden movement will have been at least inaugurated in four great Eastern cities, New York, Boston, Philadelphia and Washington. The first school garden in America was started by Mr. Henry S. Clapp at Boston, in 1890. The garden was originally intended for wild flowers and so well has the

work succeeded that at the present time it includes more than one hundred and fifty native wild plants. In 1901, a large vegetable garden was added to the flower garden. Last season Boston had sixteen of these gardens and with only this small nnmber Boston is yet far ahead of other cities in America in the school garden movement. The work at the Hartford School of Horticulture, under its capable director, Mr. Hemenway, has attracted considerable attention. Boys and girls come from the city to care for their gardens, of which there were one hundred and sixty-three last season, with the supply still far short of the demand.

At the Massachusetts State Normal School, at Hyannis, Mass., a portion of the campus was converted into a garden, which, from a commercial standpoint, was ably conducted. Each pupil was provided with a blank book into which he copied bills of the produce sold, the deposits at the bank and the checks drawn. The amount that was realized the first season was thirty dollars.

Although not connected with any institutions of learning, the Boys' gardens of the National Cash Register Co., in Dayton, Ohio, have been most important in the results that they have effected. The gardens here are 10 by 130 feet, or larger, large enough to be of commercial importance. As an example of what can be done with a garden of this size, "one boy provided a family of five with vegetables during the entire season, and in addition to this made five dollars." A competent gardener instructs the children in their work. There are various gardens in other cities in connection with schools or settlements, but the work is extremely irregular.

An idea of the cost for maintaining a school garden of one-half acre during the first season may be obtained from the following rough estimate given for Philadelphia.

Preparation of ground, including fertilizers	$35 00
Fencing, tool-house, tools	225 00
Literature, insect mounts, materials for simple experiments	10 00
Seeds and plants	30 00
Total	$300 00

This estimate does not include the salaries of attendant teachers. Trained teachers are more valuable than agriculturists without knowledge of pedagogical methods. Teachers not versed in agriculture may be supplemented by a good gardener ; if, however, the teachers do understand gardening, a laborer may take the gardener's place. This man occupies an important position in the work. He supplies the place of a janitor and assists the children in any work that is too heavy for them, such as breaking up earth with a pick-axe or managing a fifty-foot hose. During the fall, when the children are at school most of the day, he acts as a watchman, sending away truants, and during this time when weeds grow rapidly and the children's hours of work are few, he also assists in keeping the garden clean. The supervisor of the garden must be a woman that is capable of supervising and directing the work of preparing the ground, laying out plots, and erecting buildings. Some knowledge of surveying, plotting and draughting is also indispensable to her, as she will necessarily have to plan the laying out of the garden and direct both children and workmen. Upon the supervisor falls the duty of engaging workers and the responsibility of overseeing each step. Estimates and purchases of seeds and plants and the whole government of the practical gardening is to be planned by her. In addition to this, she usually gives daily nature-study talks, which must be adapted to the varying ages of the children. As harvesting progresses accurate records of produce per child, attendance of said child, effect of work upon his physical, mental and moral being must be registered. All of these steps are worth while because gardening is yet in its infancy and statistics must be obtained to convince those unwilling to embrace the idea, of its merit. Such individual records must be kept for two hundred and fifty children, to be afterwards added, balanced and the average found, more than filling the teacher's time during the hours in which the children are at school. Many interruptions to this work occur in the form of visiting classes to which the supervisor explains the work of the garden.

In Porto Rico, where school gardens are maintained by the United States government, and are connected with every public school, teachers are regularly trained for the work in the course of

theoretical and practical lessons on Agriculture. Trained teachers are somewhat difficult to find. Both Boston and Washington have foreseen this difficulty and are preparing young women for garden work,—Boston by means of the Science Department of her Normal School, Washington by a special course for Normal students, given at the school by Prof. S. C. Corbett, Horticulturist of the United States Department of Agriculture.

The Public Education Association of Philadelphia has been conducting correspondence upon the subject of school gardens, and the letters received seem to show that gardens have been connected more frequently with public schools than with private institutions, and that while the work has never been compulsory upon either teachers or pupils, it has proved a popular novelty wherever undertaken, giving healthy out-of-door study. Unfortunately the lack of space in great cities restricts the privilege of practical gardening to a comparatively small number of schools. A similar reason and consequently dearth of accessible material have been given for the lack of properly conducted nature-study in our public schools. Europe is in this respect far ahead of America. In Berlin, for instance, special gardens are maintained by the municipality, in which flowers, shrubs, and vegetables are grown in order that specimens required may be daily picked and sent in waggons hired by the city to those schools so situated that gardening is an impossibility. It has been suggested and advocated by at least one Associate Superintendent of Schools in New York City, also Mr. Gustave Straubenmuller, that a portion of Central Park be set aside for this purpose, and that specimens from its school garden be then sent daily to schools in Manhattan. Other parks that are used little by the public might fulfil a similar function. This at present seems to be the only solution of the problem of supplying schools with proper materials for Nature-study. As a new idea this may seem preposterous, but the day of experiment is past; Nature-study and gardening have become important educational factors, and thinking men and women are devising means to bring them within reach of every child in the public schools.

Of the neglect of this subject in our country Mr. Hamilton W. Mabie, in his "Essays on Nature and Culture," says: "Once

in a while some discerning man outside of the regular school interests, sees the inconsistencies of educational systems. Relationship with nature is a source of inexhaustible delight and enrichment. To establish it ought to be as much a part of every education as the teaching of the rudiments of formal knowledge, and it ought to be as great a reproach to a man not to be able to read the open page of the world about him as not to be able to read the open page of the book before him."

(Signed) HELEN CHRISTINE BENNETT,
1206 Stiles st., Philadelphia.
Instructor at Children's School Farm.
New York City, 1902-1903.

Philadelphia, January 12th, 1904.

NOTE.—The Children's School Farm in New York City was an original scheme of Mrs. Henry Parsons, a member of the Local School Board of the 11th School District of Manhattan, to whom the writer feels that she owes a lasting debt of gratitude for the training received during the past two summers. The success of the School Garden idea in New York is entirely due to the untiring energy and perseverence of Mrs. Parsons.—H. C. B.

The foregoing excellent article is sent to THE OTTAWA NATURALIST by Mr. R. H. Cowley, who has collected extensive information on the subject of School Gardens. In this connection many of our readers will follow with special interest the Macdonald School Garden experiment which will be inaugurated this spring under Mr. Cowley's direction in the County of Carleton.—J. F.

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THE GRASPING POWER OF THE MANUS OF ORNITHOMIMUS ALTUS,* LAMBE.

By LAWRENCE M. LAMBE, F.G.S., F.R.S.C., of the Geological Survey of Canada.

(With two plates.)

In the collection of vertebrate remains from the Belly River series of the Cretaceous of Alberta, Canada, made by the writer in 1901, there are a number of phalanges of the manus of *Ornithomimus altus* that throw further light on the structure of this dinosaur and on its probable habits. As little is known of the manus, or indeed of the skeleton generally of the different species of this genus, it is thought that a few descriptive remarks on the phalanges of the Belly River form may prove of some interest.

Of the pes of *O. altus* we already know that it was adapted to swift running and that the digits terminated in long, rather straight, pointed claws.

Five species of the genus have been named by Marsh from the Upper Cretaceous of the Western States. These are: *O. velox* from the "Ceratops beds of Colorado," *O. tenuis* and *O. grandis* from the "same horizon in Montana," and *O. sedens* and *O. minutus* from the "Ceratops beds of Wyoming." Of these species scarcely anything is known of the fore limb. Marsh describes and figures the metacarpals of *O. velox* and a claw bone of the manus of *O. sedens*.

The material collected by the writer does not admit of the reconstruction of the entire manus. It proves that the claws were of quite a different shape from those of *O. sedens*. (Fig 9.)

*Communicated by permission of the Acting Director of the Geological Survey of Canada.

The Upper Jurassic compsognathoid form, *Ornitholestes hermanni*, lately described by Professor Osborn, shews many points of resemblance to its supposed successor *Ornithomimus altus*. Like *O. altus* it was terrestrial in its habits and a swift runner. The similarity in form of the ungual phalanges of the manus in the two species is strikingly apparent (see figs. 3 and 4). Among the remarkable characters of *Ornitholestes* is mentioned as most distinctive "the narrowing of the manus and the great elongation of the metapodials and phalanges of the second digit, suggesting the rapid grasping power of agile and delicate prey."

Compared with that of *Ornitholestes* the manus of *Ornithomimus altus* is much stouter and less elongated, but it probably had an equally great grasping power. The terminal phalanges curve more rapidly, are proportionately deeper proximally but are less compressed laterally; from those of *Ornithomimus sedens* they differ in being deeper, much more curved and in having a greater lateral compression.

The phalanges of the manus of *Ornithomimus altus* represented in the accompanying figures, 1—6, are presumably those of the second digit; they all resemble those of the pes in being to a certain extent hollow.

The proximal phalanx is about one-third longer than the second one and about the same length as the distal one. Its proximal end is conspicuously enlarged above and at the sides and the articular surface (fig. 1*a*) is evenly concave. The condyles of the distal end are greatly enlarged in a vertical plane and a deep channelling of the articular surface extends in a curve round the end through an angle of about 223°. Posteriorly below a decided roughening of the surface of the bone occurs for muscular attachment.

The second phalanx (fig. 2) is short above but a backward extension of the inferior surface adds greatly to its length below. The proximal articular surface exhibits a sharp vertical keel, on either side of which the bone is well excavated; the distal surface has a decided medium groove extending through an angle of 180°. The enlargement below the proximal articular face combined with a well-defined roughening of the bone suggests great muscular

strength at this point. Both these phalanges are laterally compressed and have deep excavations, in the form of round pits, on either side of their distal ends. These pits are more decided on one side than on the other.

The ungual phalanx (fig. 3) is deep proximally, is much compressed laterally and terminates in front in a sharp point that is directed downward when the articular face is in a vertical position. A well-marked claw groove extends, on either side from the upper border at the apex, backward for about two-thirds of the length where it bifurcates, the upper groove reaching the articular surface below the upper border, the lower and deeper one passing downward behind a roughened enlargement of the lower surface for the attachment of the flexor tendon. The bone is rough also on the sides and upper border for a short distance in advance of the articular face. This face is vertically concave with a moderately well defined median keel extending from the lower to the upper margin.

Besides the phalanges of the second digit figured, the corresponding ones of the other manus were also obtained, as well as a few, including distal ones, belonging to other digits, all presumably of the same individual. The additional ungual phalanges are smaller than that of the second digit, are broader in proportion to their length and not so deep (see fig. 7).

In the original description of *Ornithomimus altus* reference is made to the phalanges above described as well as to the distal end of the interrupted first metacarpal, all found within a few feet of each other in the Red Deer river district of Alberta (Belly river series).

Figure 5 indicates the amount of rotation possible of the second and distal phalanges round the proximal phalanx. This is principally due to the extensive development of the distal articular surface of the proximal phalanx and is suggestive of great grasping power.

It may be surmised that *Ornithomimus altus* was capable of rapid motion in pursuit of prey which it had the power of tenaciously grasping with its fore limbs. The claws covering the terminal phalanges of the manus were evidently both long and sharp.

Ornitholestes is supposed to have pursued such "agile and delicate prey" as the Jurassic birds; *Ornithomimus altus*, also a rapid runner but of larger build, with a more robust manus of a strong grasping capacity, may be supposed to have attacked larger animals, possibly those not unworthy even of the notice of his more bulky and formidable contemporary *Deinodon horridus* of Leidy.

Ottawa, Dec. 23, 1903.

EXPLANATION OF PLATES.

PLATE I.

Phalanges of second digit of manus of *Ornithomimus altus*, natural size.

Figure 1.—First phalanx viewed from the side; 1*a*, from behind; 1*b*, from in front; 1*c*, from below.

Figure 2.—Second phalanx viewed laterally; 2*a*, from behind; 2*b*, from in front; 2*c*, from below.

Figure 3.—Third or terminal phalanx as seen from the side; 3*a*, from behind; 3*b*, from below.

PLATE II.

Figures 4 and 5.—Lateral views of the phalanges, figured in Plate I, to shew rotation. Figure 5 represents the position of the phalanges when grasping.

Figure 6.—The same phalanges from below.

Figure 7.—Ungual phalanx of manus of *Ornithomimus altus*; probably that of third digit.

The above figures natural size.

Figure 8.—Terminal phalanx of second digit of manus of *Ornitholestes hermanni*, Osborn, side view; one-half natural size.

Figure 9.—Terminal phalanx of manus of *Ornithomimus sedens*, Marsh, side view; one-half natural size.

SOME CANADIAN ANTENNARIAS.—II.

By EDW. L. GREENE.

Continuing the study of the Chilliwack Valley material collected by Mr. James M. Macoun in 1901, it becomes more and more evident that the genus *Antennaria* is strongly developed in British Columbia; so much so, that for the western slope of North America it may be said to have there its centre of distribution. And this interesting forecast is further warranted by the fact that, from the vicinity of Banff, Mr. N. B. Sanson has obtained, among other species of the genus, at least two more that are hitherto undescribed.

In attempting to describe the new species, I can not but regret the absence of specimens of the staminate, or male plants; for these have their own characters that help to establish the validity of species; and I would beg of future collectors of British Columbian Antennarias, that they make special search for male plants. They are, it is well recognized, less common than the pistillate; but they should be sought, diligently, at every opportunity.

A. SEDOIDES. Low, loosely matted, rather obviously suffrutescent, the short and slender stolons bearing a rosette of leaves at the end, these scarcely ½ inch long, rather abruptly spatulate-contracted below a very broad and short obtuse terminal part, both faces finely densely and permanently silvery-woolly or satiny; flowering stems only 2 or 3 inches high, very slender but firm, their lower leaves oblong-linear, the upper linear: heads 4 or 5, their involucres with ovate rather acute dull-white scarious tips.

By roadsides at Banff, B.C., 28th May, 1901, N. B. Sanson; only pistillate plants, and these much too young; not even yet in flower. But the rosetted stolons, looking like those of some Sidum, are very characteristic.

A. SANSONII. Short leafy stolons and slender though firm stems closely tufted, the latter 6 or 8 inches high; basal leaves small and very narrow, linear-spatulate, acutish, ½ to ¾ inch long, densely, closely and very permanently silky-woolly, the

cauline linear, acute or accuminate, erect ; cymes neither dense nor lax, of 8 or 10 heads of middle size; involucre rather strongly woolly at base, each bract marked with a brown spot at base of the long and conspicuous scarious but faintly pinkish tip, only the innermost tips acutish, the others obtuse, all apt to be a little incised.

A rather neat and elegant firmly erect species, obtained by Mr. H. B. Sanson on the slopes of Sulphur Mountain, near Banff, B.C., 16th July, 1901. It is somewhat related to *A. acuminata*, although distinct enough by its compact habit, and permanently silvery foliage. Even the dead leaves of a former year are not divested of their indument. The type is the Geol. Survey No. 26,857.

A. CHLORANTHA. Low, rather loosely tufted, 3 to 5 inches high, the short stolons not densely leafy, and leaves large for one of the *A. alpina* group, the largest about an inch long, cuneate-obovate to obovate-spatulate, acutish and mucronulate, white with a rather loose and flocculent (not compact and silvery) indument, this deciduous, the leaves of the former year quite glabrous and of a light green ; those of the stem about 4, an inch long, oblong-linear, acute, suberect, less woolly : cyme capitate, the subsessile heads about 5 ; bracts of the involucre with long deep-green scarious tips elongated and mostly acute, the innermost acuminate.

Chilliwack Valley, B.C., at 6,500 feet, by Mr. J. M. Macoun, 23 July, 1901, being No. 26,197 of the Survey ; also apparently the same under No. 26,196, from an altitude of 5,600 feet. All the specimens are too young, and show only the pistillate state, unfortunately; but the species is well marked as to habit, foliage and pubescence.

A. LANULOSA. Habitally resembling *A. chlorantha*, taller, more slender, the stolons rather rigid, sparsely leafy, the leaves smaller, more abruptly narrowed from below the obovate summit, of thinner texture, loosely white-woolly, those of the preceding year glabrous but brown and dead ; cauline linear, acuminate :

cymes large, of 8 to 12 rather large heads; involucres short but well imbricated, the scarious part of the bracts light brown, the outer obtuse, the inner scarcely acute: small achenes minutely glandular-hirtellous.

Chilliwack Valley, B.C., at 6,000 feet, J. M. Macoun, 29 Aug., 1901. Notwithstanding some likeness to the preceding, I doubt if this belongs really to the *A. alpina* group of species. Geol. Surv. No. 26,194.

A. MACULATA. Rather compact, the slender flowering stems only 2 to 4 inches high: short stolons densely leafy; leaves ½ inch long, obovate-spatulate, subcoriaceous, loosely white-woolly when young, glabrate on both faces in age and of a light green; small stem-leaves suberect, varying from spatulate-linear and obtuse in the lower to oblong-linear and acute in the upper: middle-sized heads about 5, capitate-clustred; bracts of the involucre unusually numerous and imbricated, each with a conspicuous dark spot in the middle just below the base of the scarious tip, the tips dull-white, broad and short, the outer acute, the inner obtuse, all irregularly and incisely serrate under a lens.

Also of the Chilliwack Valley, by Mr. Macoun, 29 Aug., 1901, from an altitude of 6,000 feet. The specimens are rather immature, and of the pistillate plant only, unfortunately. The Geol. Surv. number is 26,195.

Washington, D.C., March, 1904.

BIRD NOTES.—On April 26th, I surprised a pair of migrant shrikes (*Lanius ludovicianus migrans*) in the act of making a meal of a song sparrow. Rather large prey for so small a shrike. Their usual food is beetles.

Mr. J. H. Fleming, of Toronto, writes me that he once saw a Connecticut warbler at Ottawa. He being a highly capable observer, this is an addition to the local bird-list.

G. E.

RELATIONSHIP BETWEEN THE WEATHER AND PLANT GROWTH.

A COMPARATIVE STUDY OF THE LAST TWO SPRINGS.

By CEPHAS GUILLET.

During the spring of 1902 and that of 1903—that is to say from the latter part of March to the latter part of June—I have observed about 360 wild plants in bloom in and around Ottawa, 300 of which are natives. I have selected about half, or 170 (all but 27 being natives), as being the most accurately observed during both years as regards their first coming into bloom. For purposes of accurate comparison I have divided each month into periods of ten days, and shall call these periods the first, middle and last periods of the month. When the month has thirty-one days the last part contains eleven.

Of the 170 plants, I find I observed 33 to come into bloom on the same date each year, namely 9 in the middle and 8 in the last part of April; 5 in the first, 5 in the middle, and one in the last part of May; and 4 in the first and one in the middle part of June. It will be observed that the synchronous observations are especially numerous in April, half occurring then, and become less numerous as the season advances, there being only six during the last part of May and the month of June If this were all the evidence we had, we might surmise that the two seasons ran more nearly parallel during the first half than during the last, which is unusual.

But the other observations establish this in a more exact and satisfactory manner. Of the remaining 137 plants under discussion only 39 bloomed earlier in 1902, while 98 bloomed earlier in 1903. And of the 39 which bloomed earlier in 1902, 31, or about 80 per cent of them, bloomed in March, April and the first part of May, while of the 98 which bloomed earlier in 1903, only 11 bloomed in the corresponding period. The table given herewith will make this plainer. It shows in a striking way that the season of 1903 overtook and passed that of 1902 before the middle of May.

TABLE SHOWING THE PARALLELISM OF TEMPERATURE AND PLANT-GROWTH DURING THE SPRINGS OF 1902 AND 1903.

	March.			April.				May.				June.				Total.
	First & Middle	Last.	Total.	First.	Middle.	Last.	Total.	First.	Middle.	Last.	Total.	First.	Middle.	Last.	Total.	Four Months.
(*a*) Synchronous observations	....	....	.....	....	9	8	(17)	5	5	1	(11)	4	1	....	(5)	33
(*b*) Earlier bloomers of 1902	....	2	(2)	3	4	11	(18)	11	2	3	(16)	2	1	....	(3)	39
(*c*) ,, ,, 1903	....	....	.....	....	4	3	(7)	4	23	25	(52)	24	15	....	(39)	98
Total number of plants under consideration	....	2	(2)	3	17	22	(42)	20	30	29	(79)	30	17	....	(47)	170
Average lead of (*b*) four days.																
,, ,, (*c*) ,, until the middle part of May, when the lead became (in days)	....	..	.....	....	....	....	.....	....	7	10	.....	9	8	....	.....	.....
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
Average maximum temp. in 1902	37.1	52	(42.32)	50	54.4	62.8	(55.7)	56.6	65.1	70.3	(64.6)	71.6	71.9	67.1	(70.2)	(58.15)
,, ,, ,, 1903	40	45.5	(42)	48.2	54	62.8	(55)	67.7	81.1	70.8	(73)	80.5	67.8	71.1	(73.1)	(60.7)

Now, looking more closely, we find that the earlier bloomers of 1902 in April and the first part of May were on the average four days ahead of their sisters (or perhaps I should rather say children) of 1903; indeed, that is also the average of all the earlier bloomers of 1902. But the earlier flowers of 1903, while surpassing those of the same species in 1902 by only this same number of days in the earlier part of the season, yet in the latter part, *i.e.*, after the 10th of May, blossomed on the average between eight and nine days earlier than their representatives of 1902. This means that the season of 1903, which began and continued for a time four days behind that of 1902, rapidly gained twelve days on that season in the middle part of May, and held this position well on into the month of June at least. For I find that the average lead of eight days is pretty constant throughout the four periods from the 10th of May to the 20th of June, being seven, ten, nine and eight days respectively.

To anticipate the objection that these observations, while all of the vicinity of Ottawa, were not always of exactly the same locality for the same species, I selected those of the observations to which this objection could not be taken, and found that the result was substantially the same. The average for the period named is eight days, and for the different parts of that period seven, nine, eight and eight respectively. This indicates that, for example, when a given plant is blooming in Beechwood, it is likely to be blooming in Billings Bridge too; and when you find a certain species in bloom in Beechwood swamp, you may confidently look for it in bloom in Dow's or in the Britannia swamp, if it is to be found there at all. While this may be taken as the rule, there will doubtless be found localities where the conditions of soil or location are distinctly peculiar. Chelsea, for example, is situated on a southern mountain slope some two hundred feet above Ottawa; the spring plants will be earlier there. Blueberry Point, on account of a certain peculiarity of soil and flora, is also possibly an exceptional spot. It is safer to compare such places only with themselves in one's phenological comparisons. When possible, I have always used preferably observations from the same locality, and, in the case of trees, from the same tree.

Sports, also, must be excepted from such comparisons. Of

these I found at least two striking instances. One plant of the common wild strawberry, *F. virginiana*, was in bloom some ten days before its sister plants in 1902, namely on the 11th of April; and on the 17th of April, 1903, I found one Canada violet expanded, while I found no others anywhere till eight days later. Both these plants are still growing and blooming late in the fall; and winter had in this case probably caught both of them in bud, Thus the strawberry, being a perennial, and the Canada violet, protected by the thick snowy garment, acting probably as a winter annual, were both ready to proceed and open their blossoms as soon as Winter released his grip.

To account for the remarkably sudden and rapid advance in the growth of the plants last May, we should naturally infer that there must have been some remarkable phenomenon in the weather of that month. In order, then, to ascertain this accurately and to see whether the conclusions from my observations of the Comparative Phenology of 1902 and 1903 were borne out by the Comparative Meteorology of these two seasons, I, after writing the above conclusions, applied to the weather bureau for a statement of the progress of the weather during the periods named, and particularly of the temperature and rainfall. These were courteously furnished me by the Deputy Minister of Marine.

Comparing first the daily maximum temperature for the two seasons, it came out that while the maximum daily temperature of March was just about the same in both years, namely 42.3° in 1902, and 42° in 1903, yet it was better distributed to stimulate growth in 1902. For, while the first eighteen days were the same in both months, the next two days were unusually cold in 1902 and unusually warm in 1903, and consequently the rest of the month, *i.e.*, the last third, the important part for vegetation, was on an average 6.5° warmer per day in 1902, being 52° in 1902 and 45 5° in 1903. This gave that year a slight advantage at the start, which was seen in the blooming of hepaticas, for example, on the 28th March, 1902, and on the 30th in 1903; and of the silver maple on the 26th in 1902 and the 29th in 1903. This slight advantage in favor of 1902 was increased during the first third of April which was warmer in 1902 by 1.8° per day. During the rest of April, 1902 had a slightly higher average daily maximum

temperature, so that 1902 would naturally retain its lead. But the last four days of this month were on an average considerably warmer (6.7° per day) in 1903, and this continued the case throughout the two following months except in the second part of June.

It was in the closing days of April, therefore, that 1903 began to gain on 1902, and the rapidity with which it overtook and passed 1902 is readily explained by a comparison of the temperatures in May. During the first five days 1903 was only warmer by 1.4° per day. but during the next five days by 18° per day ! It was evidently during those five remarkably warm May days that the vegetation of 1903 overtook that of 1902. During the second third of May the days were 16° warmer than in 1902, or almost as much warmer as during the second five days, thus accounting for the remarkable spurt in vegetation in the middle of May, 1903, which my observations showed to exist. That last season's lead should have continued and even increased in the last third of May, is again explained by the fact that the daily maximum temperature during this period was higher in 1903 by .5°. But, although the temperature was still warmer in the first part of June, 1903, as compared with 1902, by 9°, yet there was a falling off of one day in the lead of the vegetation of 1903. Some other controlling factor seems to have operated here. During the middle part of June the maximum temperature of 1903 was less than that of 1902 by 4° per day. This change is indicated by my observations, which show a lead of eight days during this ten-day period as against nine for the previous period.

The daily *minimum* temperature, though of course not so good an index of plant growth, yet tells in a general way the same story. In both the years under consideration the average minimum daily temperature was below the freezing point up to and including the 6th April. After that date there were only five days in 1902 when the minimum fell to or below 32°, the last time being the 11th of May;* whereas in 1903 this occurred fifteen times,

* It might be pointed out in this connection, that, as the flow of the maple sap through the tap-hole is dependent upon the fluctuation of the temperarure above and below the freezing point, or 32° F., the sugar season around Ottawa must have practically ceased on the 6th April in 1902.

the last frost being, however, earlier (the 6th of May) and not severe. The minimum temperature throughout April was also considerably higher in 1902 than in 1903. So that here again we see the early part of the spring of 1902 to have been a more favorable season for growth than that of 1903.

But, while there was very little frost in the spring of 1902, there was one exceptionally severe frost, and that so late as the morning of the 10th of May, when the thermometer went down to 21° above zero. This frost did considerable damage to vegetation and must have retarded growth. One Arbor Day we had planted in the same spot at my school round leaved and red osier dogwood shrubs from Rockliffe, and they grew luxuriantly. This frost of May the 10th, 1902, nipped the round-leaved dogwood, withering all its leaves, but spared the red osier growing with it. I noticed that it also spared the alder. But, partly, no doubt, because of their nearness to the ground, it played havoc with many herbs. The early lily and lily-of-the-valley families, in particular, were badly wilted and blackened. I found no *Clintonia* in bloom that season, owing, I thought, to the frost.

While in March the minimum daily temperatures ran roughly from 20° to 35°, and in April from 30° to 40°, in May and June they ran from 40° and 45° respectively to 60°. But dividing the months into three periods, it is found that the average minimum temperatures for the three parts are roughly 40°, 40° and 50° in May 1902, but 40°, 50° and 50° in May, 1903; and 40°, 50° and 50° in June, 1902, but 50°, 50° and 50° in June, 1903; showing that the middle part of May and the first part of June were much colder in 1902 and that the month of May, 1903, had about the same minimum temperature as the month of June 1902. This reinforces our previous conclusions regarding the phenomenal growth in May, 1903.

I was struck with the steadiness and evenness of the rise of the minimum as compared with the maximum temperature: a fact due to the constancy with which the earth absorbs heat and the tenacity with which it retains it, as compared with the rapidly waxing strength of the sun's ever more perpendicular rays, much of whose heat, however, is often intercepted and irradiated by

clouds and winds, or absorbed in the evaporation of rain. The average minimum temperatures of every ten days of May and June, 1903, were respectively 37.8°, 51.8°, 51.1°, 52.6°, 51.8° and 53.3°; while the corresponding maximum temperatures were 67.7°, 81.1°, 70 8°, 80.5°, 67.8° and 71.1°. It was in May that the most rapid rise in minimum temperature took place, namely that from about 40° to about 50° during the middle of May, 1903, and the latter part of May, 1902.

Comparing now the rainfall of the two seasons, we find that there is a marked difference in the amount and still more in the distribution of precipitation. It 1902 it amounted during the four months under consideration to 12.32 in.; in 1903 to 8.97 in. Or, leaving out of account the last third of June, which my plant-observations do not cover, 10.65 in. and 5.06 in.; that is more than twice as much rain in 1902 as in 1903 for the period covered by my observations. In 1902 the rain was well distributed, being for March, April, May and the first two thirds of June 3.47, 2.74, 1.82 and 2.62 inches respectively, which is not very different from the average for 20 years. But in 1903 the figures are 1.35, .95, .12 and 2.64 inches. In 1903, therefore, there was comparatively little precipitation in the spring before June, and next to none in May ; and even in June the rain did not fall in any appreciable amount until the 12th, when it rained 1.59 inches and continued rainy throughout the rest of the month. Furthermore, there was no rain in April after the 7th. In fact from the 8th April to the 11th June inclusive there fell only .22 in. of rain ! That period, therefore, of over two months' duration, was literally one long drouth. Occurring as it did, however, so early in the year, when the ground was saturated with the winter snows, its effect was, as we have seen, to force vegetation forward rather than to retard it, *until towards the end of the drouth.* For we found that, in spite of the fact that the weather continued warmer, and indeed increasingly warmer in the first part of June, 1903, as compared with 1902, yet there was an actual falling off in the lead of 1903 over 1902 in plant-growth during that period, when the average daily temperature was 7° higher in 1903.

I was not surprised at this result, as I remember noticing the blighting effect of the drouth on certain of our wild plants. I

noticed *Unifolium Canadense* in bud as early as the 29th of April. On the 15th May I have the following note: "Most of the bunches of buds of *Unifolium Canadense* have shrivelled up; others—lately developed probably—are about ready to open, but rain is needed!" The flowers expanded about a week later. This was in Beechwood Cemetery. At Chelsea they came into bloom about a week earlier than here and at the same time as the previous year but not so abundantly. Wild columbine, which already had large buds on the 27th April, seemed to be affected by the drouth, being very slow in opening its buds in May. In the middle of May, 1902, I found plenty of *Capnoides sempervirens* in bloom on the rocks of the island at Chelsea; at the same time last year I could find no trace of the plant. I found *Anemone riparia* in bloom in abundance at the Beaver Meadow very early in June, 1902; last year I did not find it there at all. Several plants found blooming in the lane near the bridge at Beaver Meadow, Hull, in 1902, were not to be seen there in 1903, as *Sedum acre* and *Capnoides aureum*. *Iris versicolor* was abundantly in bloom in the swampy ground near by very early in June, 1902, but not last year. I found *Trifolium aureum* earlier in bloom last June than the previous June, but its growth was stunted. Twin-flower and the pitcher plant were burnt brown by the heat where exposed. The drouth had probably something to do with all these failures.

At the end of April, 1902, I found *Draba nemorosa* pretty abundantly in bloom along the river bank at Tétreauville, and before many days its little yellow flowers covered the ground. Last year I was unable to find the plant at all. The dry spring was probably unfavorable to its growth. Prof. Macoun, to whom I am indebted for much cheerfully given help in this investigation, told me that *Draba nemorosa* had been found only once before around Ottawa, namely in 1900 by himself near the St. Louis Dam. Other rare plants I found in bloom in 1902 are *Cynoglossum virginicum*, 17th June, at Tétreauville; *Symphoricarpos racemosus*, 28th June, at Rockliffe; *Heracleum lanatum*, 28th June, near the mouth of the creek draining Hemlock Lake; and in 1903, 25th May, *Corallorhiza corallorhiza* at Britannia.

It was not the purpose of this paper to compare these two seasons in detail with the preceding. I have also not dealt with

bird-migration, which is another interesting index. Suffice it to say that my plant notes and bird notes, and the weather records kindly furnished me by Mr. Stupart, the director of the meteorological service, alike show these last two springs to have been both unusually early. Both had in March and April almost the same mean temperatures, which were in March 10.9° (1902) and 11.4° (1903) higher than the average for twenty years,* and in April 4.5° (in 1902) and 2.9° (in 1903) higher than the normal. And the hot, dry month of May, 1903, of which we have spoken at length above, was 3.6° hotter than the normal, while May, 1902, was 1.7° cooler than the normal, and June of both years cooler than the average by 4.4° and 2.4° respectively.

Comparing the past two springs with the previous two, we see again how remarkably early they were. The mean monthly temperature of March, in 1900, was 18.6°, in 1901 it was 24.3°, while in 1902 it was 33.9° and in 1903 34.4°. It is little wonder that hepaticas and silver maples bloomed earlier in 1902 and 1903 than in 1900 and 1901. But why they should have bloomed from two to three weeks earlier is not so apparent, when we consider the interesting fact that the *temperature of April was about the same for all four years.* But happily we are not left without an explanation, which lies in the state of the soil. In the falls of 1901 and 1902 snow fell early and steadily before the frost had entered the ground, consequently there was no frost in the ground to retard vegetation when the snow went off in the spring. In the previous two years the conditions were precisely the contrary: the frost got well into the ground before the frost came, so that the succeeding springs of 1900 and 1901 were much retarded not

* These mean temperatures are somewhat higher than that of March, 1898, which was the warmest March of which we have any record prior to 1902, its average maximum temperature even exceeding those of the Marches of 1902 and 1903 by a small fraction of a degree, being 42.36°. Miss V. Lees informs me that she found hepaticas in bloom on Pine Hill, New Edinboro', on the 27th of that month, which is the earliest record for hepaticas of which I have heard. While this article is printing I am able to state that this spring hepaticas have not, so far as I know, been found in bloom earlier than the 16th April, and up to to-day (23rd April) I have seen no other wild plants in bloom. Till to-day the temperature has not reached 50° One swallow does not make a summer, nor one hepatica a spring !

only by the slowness with which the snow melted in those cold, ice-bound Marches, but also by the frost in the ground under the snow tending to delay growth.

It is not to be expected that two springs so unusually early, two Marches of so remarkably high a temperature, will be followed by a similar one. One of the conditions that make for the early growth of plants is certainly present. I have found, by digging down through the three feet of closely packed snow and ice in the woods, that the ground there is not frozen though it is in the open field. Therefore, when the snow disappears, or, indeed, before that, plant-growth will be possible in the woods. But the snow this year is of unusual depth,* and will be longer in melting, not only because there is more to go, but because the very presence of such a mass of frozen matter makes for lower temperatures. It is probable, however, that when spring does come it will come in with a rush and be a rapid season. For with temperature, as with other things, there is always a tendency to rhythm, to wave-motion ; so that, as we are having temperatures so constantly, so phenomenally low this winter, we may expect unusually high temperatures later on. Although a cold winter does not always presage a warm spring (it did not in 1875, the coldest winter on record, nor in 1883, nor in 1885), yet it is not usual, Mr. Stupart informs me, to have more than three consecutive months below normal. In dealing with the weather, however, it is certainly easier to be wise after the event. Long forecasts regarding the weather, indeed, partake rather of the nature of guess work than of true prophesy. The conditions affecting weather are so numerous, complex and remote, as to make meteorology the most difficult and the most backward of all sciences, not even excepting physiology.

Finally, comparing the spring drouth of 1903 with previous drouths at that season, we see how phenomenal it was. Mr.

* As this article is being printed, I have ascertained the snowfall of the past winter to be 105.7 inches, which is 8.8 inches above the average for thirty years. Even this heavy snowfall did not everywhere protect the ground in the open during the past severe winter. The snowfall of the previous winter was unusually light, being but 72.9 inches.

Stupart has kindly furnished me with a record of the dry April-May periods of the past thirty years. They are as follows :—

1876--2.15 inches of rain.
1879—2 64 "
1896—3.10 "
1898—3.21 "
1900—3.76 "
1903—1.07 "

It is certain, therefore, that the drouth of 1903, lasting from 8 h April to 11th June, during which only about a fifth of an inch of rain fell at Ottawa, is easily the driest spring on record. It is remarkable how little harm it did, which shows how well fitted our finely watered district is to withstand drouth. As an instance, however, of the fact of compensation, of the fact that things do tend to average up, it is worth mentioning that, in spite of the long drouth in the Ottawa Valley last spring, the precipitation here for the year 1903 was only one inch below the average mean of 33.6 inches; and the additional fact that in revenge for the unusually hot May we had an unusually cool summer. The hottest day last year was the 19th of May, when the thermometer registered 90° in the shade. The average annual maximum temperature of Ottawa is 93.8°. July, which, as is usually the case, was the hottest month, exceeded May in average maximum temperature by only 3.7°. August had a lower maximum than May.

It is well known that plant growth is dependent upon meteorological conditions and particularly upon temperature and rainfall ; but that the dependence is so absolute, that the parallelism is so true and delicate as even these few observations with all their liabilities to error yet indicate, was to me very interesting and gratifying: interesting as the spectacle of the orderly reign of law must be to everyone who studies it ; and gratifying, as proving that my observations, which I was, to tell the truth, a little fearful of putting to the test, must have been fairly accurate.

Such a study tends to clarify one's ideas regarding many interesting phenomena That the plants, instead of all springing up together at the first blush of spring, should range themselves, so to speak, in a procession throughout the season, is partly due

to their varied sensitiveness to heat, as well as to their more or less favorable situation for receiving the heat. The sensitiveness of our wild plants to heat has been determined in very few cases. In our hemlock, the lowest temperature at which the chlorophyll-corpuscles turn green is between 44.6° and 53.6° F. The decomposition of carbon dioxide with evolution of oxygen begins in potomogeton between 50° and 59°, and in the eel-grass above 42.8°. Even the most sensitive, *i.e.*, the most prompt to react in this way, as the larch and meadow-grass, require a temperature above the freezing point, between 32.9° and 36.5° in the case of the larch, and between 34.7° and 38.3° for the meadow-grasses. From our observations we might reasonably infer that silver maples, hepaticas, spring beauties and the trailing arbutus, all of which have been found *blooming* in March in one or both of the last two springs with a maximum temperature of about 50°, rank with these in readiness to react to heat stimuli; while golden-rod, asters and indeed most of the Composite family must require a great deal of heat. On the 6th of April, 1903, after several cool days and frosty nights, I have this record: "Still cool and cloudy; no growth." In going about the streets and the woods I had noticed little or no change in the vegetation those days. The aspen and alder catkins, which I noticed well shaken out on the fifth, did not begin to shed pollen until the ninth, which was a fine mild day, the temperature reaching 56°. The habit of the plant as regards the order of growth of stock, leaves and flowers is another factor conditioning the time of blooming. Plants such as the hepatica, trailing arbutus, early coral-root, silver maple, alder, aspen, hazel, and glaucous willow, which in the spring devote their new-found energies of growth to the unfolding of flowers-buds already formed the previous year, will naturally bloom early; while those which, like the golden-rod and oak and ash, attend first to the growth of stock and stem and leaves will naturally bloom relatively late.

A word might be said here regarding the time when the various orders and families of plants come into bloom. During April in these two exceptionally early springs I found 75 species of plant in bloom, including two grasses and six sedges. Leaving out of consideration the sedges and grasses, which I observed

only in April, I find that the chief blossoming-time for our flowering plants is the end of May and the beginning of June. During the last third of May and the first third of June I found 136 plants coming into bloom, or exactly 68 for each period. This is about 40% of the whole number found blooming before the end of June. In every ten-day period before this, the numbers gradually increase towards this climax, while they fall off thereafter. I found no violets come into bloom after May and very few of the lily and lily-of-the-valley families; they are found from the middle of April on. On the other hand the St. John's Wort family, which belong to the same order as the violets but have a different habitat, come into bloom in July. The poppy family has some April representatives. The poplars and willows, elms and maples bloom early; indeed most, if not all, of our trees are in bloom before June. The irises and orchids do not bloom before May. The order of the *Ranales* and the rose order begin to bloom early and furnish a great number of species, perhaps 80% of their number, throughout April, May and June, beginning with the hepatica, our earliest flower. Much the same may be said of the cress or mustard family (which begins with the cut-leaved toothwort) and the heath order (beginning with the trailing arbutus, almost, if not quite, as early as the hepatica) though they are not quite so abundant in the beginning. The cress family may nearly all be found in bloom before the middle of June, while quite a number of the heath order bloom in July. The pink family and the umbel order have each only one representative in the latter part of April, viz., the larger mouse-ear chickweed (*Cerastium vulgatam*) for the former, and the dwarf ginseng for the latter; but soon after they become very abundant, especially the umbel order. The more highly developed plants seem to be, as a rule, poorly represented in the spring, being largely summer bloomers, which would suggest that their greater complexity required time to unfold. I refer to the primrose, borage, mint, potato and figwort families, the gentian order, and especially the great order of the *Campanulales* which includes the numerous *Composite* family. Of the *Rubiales* I found only one species of galium blooming in May, but six in June; *mitchella repens* also is not found till towards the end of June; but the honeysuckle family, while furnishing but one plant

blossoming in the latter part of April (the 30th), furnishes many in May and June. The earlier plants of spring are mostly woodland or (generally rather later) swamp plants; which, not requiring much heat, find the moist and shady woods or the cool, wet swamps a favorable habitat. Such are, for the woods, the violets, the lilies, the early poppies, the saxifrages and mitreworts, strawberries and hepaticas; and for the swamps and wet places, many orchids, irises, cresses and speedwells, etc. Towards the end of spring the flower-lover will find the woods comparatively bare of flowering species and will turn to the sunny shores of lake and river, both in the water and on land, where will greet him water plants of many kinds, and spiræas, button-bush, St. John's wort, loosestrifes, bluebells, epilobiums; and to the clearings, the fields and roadsides, where he will find roses, raspberries, peas and clovers, and finally mallows, mints, gerardias, lobelias, gentians, thistles, beggar-ticks, sunflowers, golden-rods, asters, and in short all those highly-developed plants which delight to bask in the direct rays of the sun.

The weeds, with very few exceptions, are late bloomers, which may be explained by the fact that they are mostly annuals, springing from the seed which has lain dormant until awakened by the warmth of spring. There is therefore considerable growth necessary before flowers can be produced and this takes time. The following weeds, however, I found blooming in April: the European strawberry, shepherd's purse, Buxbaum's speedwell and the dandelion. Of these the strawberry and dandelion are perennials that bloom continually throughout the season, and only suspend growth while the unfavorable winter conditions last. They are therefore ready to go on blooming early in spring. The shepherd's purse is a winter annual, germinating and vegetating in the fall, and so ready likewise to bloom early in the spring. The other weed that I found blooming in April, namely Buxbaum's speedwell, may possibly also have acted as a winter annual.

I might add that having found plants in bloom in March and well on in November. there are only three months when one need never look for wild flowers around Ottawa, viz., December, January and February. And I am not so sure that dandelions, or sweet clover, or *Linaria linaria*, popularly known as butter-and-

eggs, might not be found still blooming at the beginning of December some very late fall in favorable situations. But the only way to see our wild plants in bloom in the middle of winter is to dig them up and bring them home in the fall. I have got sweet cicely to bloom in this way, and my pupils were able to have hepaticas and spring beauties in flower at Christmas-time,—a charming little bit of the spring woods! It can not be said of all Canada, however, that wild flowers never bloom in February in their own habitat; for on the British Columbia coast, under the influence of the warm Pacific current, at Chilliwack and Vancouver for example, spring opens in the latter part of February with the blossoming of willows and alders; while on Vancouver Island there is hardly any cessation of growth at all during the winter, and a great many species of wild plants may be found blooming in February.

That seeds long dormant should suddenly germinate and grow luxuriantly when the frost cover is removed, is doubtless due to the great amount of heat, and possibly light, necessary to the germination and growth of these plants—an amount that does not exist in the shade of the poplars, spruces and pines. When these trees grow up again, the heat-loving willow-herb and golden-rod, blueberry and raspberry die away, leaving their seeds, or in some cases the roots, to represent them and to assert their rights when the proper heat-stimulus is again present. The need of oxygen for the germination of the seed is also a factor here. The clearing away of forest cover allows a freer circulation of air, and the oxygen in the air has a better chance to come into contact with the dormant seeds.

Finally, it would appear from this study that the vegetation of a given region would be just as true a criterion of its climate as the climate would be of its flora. They are converse propositions. And plant-growth, being really the resultant of the complex conditions making up what we call *weather*, is thus a very simple and beautiful index of the progress of the seasons.

February, 1904.

MEETINGS OF ENTOMOLOGICAL BRANCH.

Meeting No. 11 was held at Dr. Fletcher's on January 14th, 1904 ; seven present. Dr. Fletcher explained that the meetings had been interrupted for several months, owing to absence of members and to other causes, but that in resuming them it was recognized that they were of much value to the members, upon whom he called to set forth the results of their past season's collecting and observations. Mr. Gibson read a paper on "An Interesting Enemy of the Iris," in which he described the larva of *Macronoctua onusta*, which had infested the stems of irises at the Experimental Farm. Dr. Fletcher instanced, among such stem-boring caterpillars, the larva of *Gortyna purpurifascia* which had in a previous season greatly infested their columbines. Mr. Gibson said that larvæ of the rare *Apantesis superba* (var. *nevadensis*, Dyar's List) had been received from Vernon, B.C., and had been successfully reared. Of six caterpillars, two had been inflated and four bred to the moth. Larvæ of *A. docta* (var. *arizonensis*) had also been received from Phœnix, Ariz. Dr. Fletcher spoke of the value of the chitinous head-case of some larvæ as of even greater value than the skin in determining the number of the moult of the caterpillar. In reply to an enquiry by Dr. Sinclair as to the chief value of breeding these forms, he explained that one of the principal aims of such studies was to ascertain that stage in the lite of the insect in which injurious forms might be most easily and economically destroyed. The habits of various cutworms were mentioned, and the remedies, such as bunches of poisoned weeds, etc., which might be applied to check their depredations. Mr. Metcalfe exhibited a collection of Homoptera, chiefly the smaller leaf-hoppers, which he had made at Brockville during the summer. There were about forty species named by Mr. Van Duzee, and many of these were represented by long series of carefully mounted specimens. He also showed samples of the curious little Chrysomelid beetle, *Exema dispar*, which is obtained from goldenrods by using a sweeping or beating-net, and which probably escapes many enemies by its marked resemblance to the excrement of caterpillars. Mr. Baldwin showed the results

of some recent outings, among which was a *Bombus ternarius* impaled upon a thorn by a shrike. Dr. Fletcher described the success which he and Mr. Gibson had attained in breeding the rare moth *Apocheima rachelæ*. Two of the hairy wingless females were shown alive, and mounted examples of the delicately colored, winged males, with inflated larvæ in all stages. The various stages of *Leucobrephos middendorfii* were also shown Dr. Sinclair spoke of the opportunities afforded to naturalists by the country surrounding his summer residence in Muskoka, and some discussion followed on the flora and fauna of that region, and on the occurrence of rattlesnakes in Canada. Dr. Fletcher briefly outlined his summer lecture tour in Manitoba, the Territories and British Columbia. The ascent of Mt. Cheam had been a disappointment, as unusually bad weather prevented any effective collecting. A couple of days were passed at Kaslo, B.C., where Dr. Dyar with two assistants had spent several weeks, making large collections of lepidoptera and breeding about 200 species. The new Moth Book published by Dr. Holland was examined and much admired by the members.

SUB-EXCURSION.—The first outing of 1904 took place on Saturday, January 23rd, at the Experimental Farm, when eight, including two ladies, turned out on snow shoes, to see how things appeared in mid-winter. The tramp was through the arboretum to the canal, returning by a circuit again through the aboretum. The great depth of snow offered little chance for collecting, as all smaller forms of vegetation were buried, and the finds were limited to some cocoons and galls. A very pleasant and instructive hour was passed, however, in examining the trees, and appetites were sharpened to do justice to a good hot supper prepared by the host and his assistant.

MEETING No. 12 was held at Mr. Harrington's, on Jan. 26th, 1904 ; five present. Mr. Gibson read an interesting paper entitled "A Night's Collecting at Meach Lake," descriptive of a visit paid by him to Mr. Young during the summer, and mentioning some of the most important moths which had been taken at sugar and light. The neighbourhood of the lake has always

proved productive to all naturalists who have attended the Club excursions, and Mr. Young during two summers spent there has made extensive collections. Fourteen species of the rarer moths were shown. Mr. Metcalfe exhibited a neatly mounted collection of flies, mostly small species, consisting of about 500 specimens, which he presented to Dr. Fletcher, for the museum of the Experimental Farm, to the collections in which it will be a valuable addition. Mr. Harrington showed two large pupal cases, apparently of a Hepialus, which he had taken from an old maple tree on the Aylmer road. He also exhibited two boxes of insects in various orders taken during 1903, and containing several species as yet undetermined. Dr. Fletcher exhibited a female *Mantis carolina* which he had kept living for some time and whose rapacious habits he graphically described. Mr. Harrington referred to a larger species, equally voracious, which he had frequently observed in Japan. Mr. Baldwin showed some galls from willows and raspberry.

MEETING No. 13.—Held at Mr. Gibson's on February 10th, 1904 ; eight present. Mr. Baldwin showed some recently collected cocoons of moths, also of the sawfly *Trichiosoma triangulum*, and of spiders. Mr. Metcalfe submitted a list of 43 species of hemiptera, representing 34 genera, taken at Brockville, Aug.-Nov., 1903. Mr. MacLaughlin stated that, while unable to do any collecting, it appeared to him that there was an unusual scarcity of dragonflies last year, due probably to the excessively dry spring. Dr. Fletcher referred to the immense swarms of a species of Gomphus which had appeared in Ottawa some years ago, and which had not since been observed in any special abundance. He also spoke of the myriads of dragonflies seen by him last summer upon the North-west prairies, chiefly *Diplax rubicundula* and *D. costifera.*

Mr. Harrington exhibited a case of Ottawa Buprestidæ, containing about 40 species of these destructive beetles, and read a paper giving the dates of appearance and notes on the habits of the various species ; regarding the majority of which much is to be learned. Dr. Fletcher had found *Buprestis langii* abundant in the upper country of Alberta and British Columbia upon the

bracken fern. He also reported that a species of Agrilus had recently become a serious enemy to the birch. A white birch tree near his house had been killed apparently by this insect, but as the beetles emerged during his absence he had obtained no specimens. Mr. Harrington thought it might be *A. obsoletæguttatus*, of which both sexes had been taken upon birch. Some discussion followed as to the duration of the larval stage of Buprestidæ and on retarded development in these and other insects, due to deficient heat, moisture or food, or to causes not yet understood. Mr. Young showed a hawk-moth, *Cressonia juglandis*, and described a curious crepuscular flight of the males, which he had observed at Meach Lake; the moths flying too and fro across a patch of smooth water and repeatedly dipping the tip of the abdomen in the water. He also showed *Thecla læta*, a little blue butterfly, new to the Ottawa list, and which is a well known cotton pest in the Southern States. Dr. Fletcher exhibited, as a really rare insect, the fine moth *Hepialus thule*. This species was described from a specimen taken some years ago at Montreal, and so far it has not occurred elsewhere. It is stated to fly only between 8 and 9 o'clock, p.m., during the brief period of its winged existence. Dr. Fletcher also read some extracts from proofs sheets of the Entomological Record for 1903 (Rept. Ent. Soc. Ont.), which indicated that entomologists, especially in the Western provinces, had made many good captures during the year and had largely added to our knowledge of Canadian insects. Mr. Gibson said that in 1991 eggs of a then undescribed arctian moth had been received from Mr. Cockle of Kaslo. Last year similar eggs had again been received and the moths had been bred. Dr. Dyar had also bred the species at Kalso and had named it *Diacrisia kasloa*. Inflated larvæ, pupæ and five imagos were exhibited.

W. H. H. (Sec.)

MEETING OF THE BOTANICAL BRANCH.

The first meeting in the new year was held at the residence of Mr. A. E Attwood on January 7th. Those present were Dr. J. Fletcher, Prof. J. Macoun, Dr. C. Guillett, Mr. E. R. Cameron, Mr. W. T. Macoun, Mr. R. B. Whyte, Mr. J. M. Macoun, Mr. D. A. Campbell and Mr. Robert Hamilton.

By special request Mr. W. T. Macoun read a very graphic description of a trip made by him several years ago up Mount Arrowsmith, Vancouver Island. The reading of the paper was followed by some very interesting and amusing reminiscences by Prof. Macoun and Dr. Fletcher, who have also made the ascent of this very picturesque mountain.

Mr. E. R. Cameron read an extract on "Weeds" from John Burroughs' "Pepacton" in corroboration of what Prof. Macoun had stated on that subject at the previous meeting.

"It is a fact," writes Burroughs, "that all our most pernicious weeds, like our vermin, are of Old World origin. . . . .We have hardly a weed we can call our own; I recall but three that are at all noxious or troublesome, namely, milkweed, ragweed and golden-rod."

Some time was spent discussing a question asked by the chairman: "Why are the plants of my window-garden not thriving better?" Lack of success with potted plants in an ordinary living-room may be due to unsuitable soil, injudicious watering, dryness of the atmosphere, the presence of dust and insects on the plants, insufficient sunlight, inadequate development before bringing into the house, or worms in the soil.

As an outcome of the discussion on the management of potted plants, it was decided to prepare a list of books that would be of assistance to the amateur and professional lover of plant life. The following may therefore be considered as a select bibliography of guides in the identification and cultivation of plants.

I.—BOTANICAL KEYS.

An Illustrated Flora of the Northern United States and Canada. Britton and Brown. 3 vols. $9.

Field, Forest and Garden. A Simple Introduction to the Common Plants of the United States east of the Mississippi—both wild and cultivated. Asa Gray.

Manual of the Flora of the Northern States and Canada. Nathaniel Lord Britton, Ph.D. 1080 pp. $1.50.

Manual of the Flora of the Northern States and Canada. New edition. (In preparation.)

II.—POPULAR BOTANICAL GUIDES.

Our Northern Shrubs and how to Identify them. Harriet L. Keehler. 500 pp. 240 ill. $2.

Handbook of the Trees of New England with Ranges throughout the United States and Canada. Lorin L. Dame and Henry Brooks. 200 pp. 87 plates. $1.

Trees, Shrubs and Vines of the North-eastern United States. H. E. Parkhurst. 250 ill. $1.50.

Our Native Trees and how to Identify them. Harriet L. Keehler. 500 pp. 340 ill. $2.

Studies of Trees in Winter. A Description of the Deciduous Trees of North-eastern America. Annie Oakes Huntington. 190 pp. 80 ill. $2.50.

A Guide to the Trees. Alice Lounsberry. 312 pp. 64 col. ill, 164 bl. & wh. ill. 54 dia. $2.

Nature's Garden. An Aid to a Knowledge of Our Wild Flowers and their Insect Friends. Neltje Blanchan. 400 pp. 80 ill. $3.

How to Know the Wild Flowers. Frances Theodora Parsons (Mrs Dana). 48 col. ill. $2.

A Guide to the Wild Flowers. A description of 500 plants. Alice Lounsberry. 347 pp. 64 col. ill. 100 bl. and wh. ill. 54 dia. $2.

Mushrooms, Edible and Poisonous, with recipes for cooking, and the chemistry and toxicology of mushrooms. Prof. Geo. F. Atkinson. 320 pp. 230 ill. $3.

The Mushroom Book. Nina L. Marshall.

Our Ferns and their Haunts. Willard Nelson Chute. 332 pp. 200 ill. $2 15.

How to Know the Ferns. Frances Theodora Parsons (Mrs. Dana). 150 ill. $1.50.

Ferns. A Manual for the North-eastern States. C. E. Waters, Ph.D. 362 pp. 200 ill. $3.

Sylvan Ontario. A Guide to our Native Trees and Shrubs. Dr. W. H. Muldrew, B.A. 131 leaf-ill.

III.—WORKS ON PLANT CULTIVATION.

The Window Flower Garden. Julius J. Heinrich. 120 pp. Illustrated. 50c.

Home Floriculture. A Practical Guide to the Treatment of Flowering and other Ornamental Plants in the House and Garden. Eben E. Rexford. 300 pp. 72 ill. $1.

Garden-Making. Suggestions for the Utilization of Home Grounds. L. H. Bailey. 417 pp. 256 ill. $1.

How to Make a Flower Garden. A manual of practical information and suggestions. A charming book by experts on every branch of the subject. 370 pp. 200 ill. $2.

NATURE STUDY—No. XIII.

NATURE STUDY IN THE WINNIPEG SCHOOLS.

By J. B. WALLIS, Supervisor of Nature Study. Winnipeg.

For some years there have appeared on the Programme of Studies for Manitoba a number of suggestions as to subjects which might be classed as Nature Study. Such was Agriculture, which took the forms of a small box of chemicals and of colored plates of some common Manitoban flowers and weeds. These had a definite value ; but the teachers did not know exactly what was required of them, and too often the experiments in agricultural chemistry were allowed to degenerate into an hour's amusement; and the colored plates were put away in a drawer, or were used to decorate the school walls. It is safe to say that Nature Study as we know it to-day, had then no place in the work of the schools. In a few cases, a teacher, herself enthusiastic, would arouse the enthusiasm of her pupils about Nature ; but, even then, it was usually done with little thought of the curriculum. The trouble was, the work was too indefinite ; and it remained for the committee which completed its labors last year, to place on the Programme of Studies a series of definite topics which covered the whole range of the subject as understood by its most advanced advocates.

Even then, the troubles had by no means all disappeared. The teachers were frightened of the work. Arithmetic, history, etc., they could teach ; but this new work, which they were not to *teach* was, even with its assigned topics, something altogether different.

The Winnipeg School Board realized this, and appointed a supervisor of Nature Study for one year. In that time, they considered the subject should be on a firm basis and the teachers all able to continue the work without further supervision.

The plan was inaugurated last September, and a valuable fortnight was taken up in finding what had already been done in the schools and what material was within reach. Programmes were drawn up, meetings of teachers held and the topics and purposes of the work explained. The main purposes kept in view

were : (1) Interest of the pupils in their surroundings ; (2) Training in self dependence ; (3) Knowledge.

(1) It was felt that, without interest, the very life and soul of the work would be lost ; so, all first efforts were directed towards this end. If the pupils were interested, observation would naturally follow. Few people realize how blind the majority of us are.

(2) Training in self dependence was believed to be one of the greatest values of Nature Study. In other subjects, books may be used, the teacher may help ; but the very essence of Nature Study is that it is the pupil's own eyes and brain that do the work ; it is all first hand, so that this value has been considered almost more than any other.

(3) While fully realizing the value of the knowledge to be gained, it was deemed advisable not to accentuate this too much. The teachers were already inclined to lose sight of the other values and consider only this, which was so much more in line with the usual school work.

Keeping these purposes in view, each monthly programme was made as varied as possible. The more varied the subjects, the more chance of appealing to the individual pupils and of interesting the teachers. And, further, the design was to arouse the pupils' interest in their whole environment.

The following outline gives a few of the topics on the programmes, with the reason for their appearance and the suggested methods of taking them up.

(*a*) Flowers and Seeds. This was meant to give the pupils a speaking acquaintance with a few of our common fall flowers. Seeds which had special means of dispersion were collected, and during the winter were discussed with the classes, attention being directed to the clever ways in which mother plants distribute their seeds. Common fruits were also studied. This proved a delightful topic with the children, who doubtless will watch the plants during the coming summer with great interest.

(*b*) Animals. The study of animals was taken up by all grades up to the sixth, but from very different standpoints. In the junior grades, the object was to interest the pupils more fully in the habits and care of domestic animals ; in the senior grades, in the relation of the animal to its environment ; and the chief object was the preparation of the pupils for the fuller study of adaptation in spring. This work proved exceedingly interesting, and, among the older pupils, much individual observation work was done and many hypotheses advanced to answer questions suggested by themselves.

(*c*) The Moon. The great purpose of this topic was to show pupils that by thoughtful observation many interesting problems could be solved, and to stimulate them to find out about some of the wonders of creation which are so often taken as matters of course. The pupils were to make observations and drawings, and then by wise questions the teacher was to lead them to suggest causes for the apparent double motion of the moon and for its change in appearance. This topic proved both a brilliant success and a dismal failure. In a few cases it was simply astonishing how readily the pupils—without being told anything—came to a clear understanding of the motions and phases of the moon, but in others very little was accomplished. On the whole, while the chief object was not always attained, so much interest was aroused that no doubt the moon will be looked upon by the pupils very differently in the future.

(*d*) Evaporation and Condensation. An effort has been made to arouse wonder in the children's minds, so that they may desire to understand all they see. Thus when it snows, the wish to know why it snows, where snow comes from, how it got there, and many other queries would naturally arise. These studies were taken up in order that such questions should be answered. The results were fairly satisfactory, though in a few cases the desire of the teacher to tell, worked somewhat against complete success.

(*e*) Stars. The senior grades were helped to find a few of the prominent constellations and to recognize some of the brighter stars. This proved most successful. The purpose was to arouse interest and the pupils, on the whole, were delighted with the work. It was almost amusing, too, to notice how the teachers seized upon this topic as something they could do, something tangible, something requiring explanation; and, with this, the poorest Nature Study subject we have taken up, they felt quite at home.

From the above an idea of what we are attempting may be gathered. During the coming months we hope to do a great deal of most interesting work. Birds, flowers, insects, the weather, and much else will receive attention. Special work will be: seed germination and experiments on the growth of plants; insect study, such as of the ant, with experiments suggested by the pupils; a flower-growing competition, and, not least, aquaria-keeping, with particular study of such creatures as mosquitoes, dragonflies, toads, and almost anything which the class may propose.

Having now touched upon what has been done in our schools, it may be well to mention some of the difficulties that had to be faced.

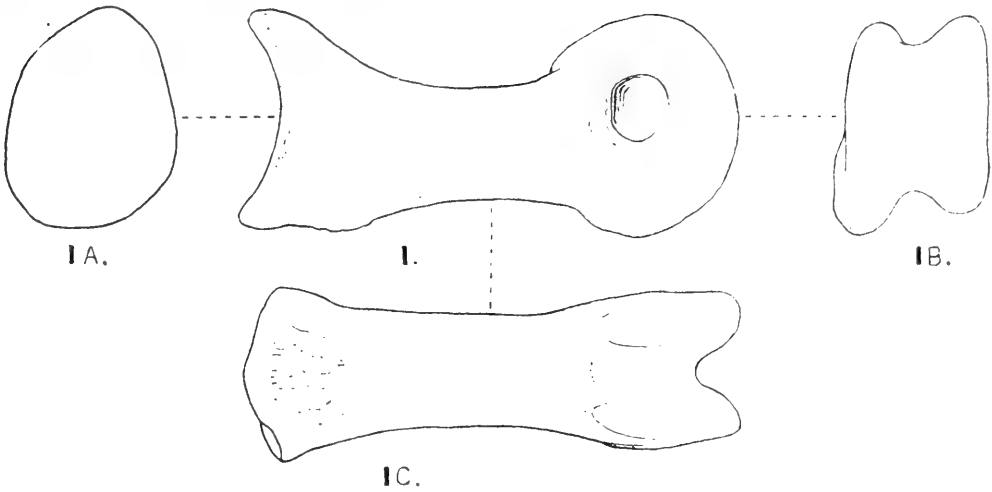
First came the question of time. The curriculum seemed already crowded. Other work showed results which could be seen; Nature Study was so entirely a matter of attitude that naturally there was a strong temptation to let it, if anything, be left undone.

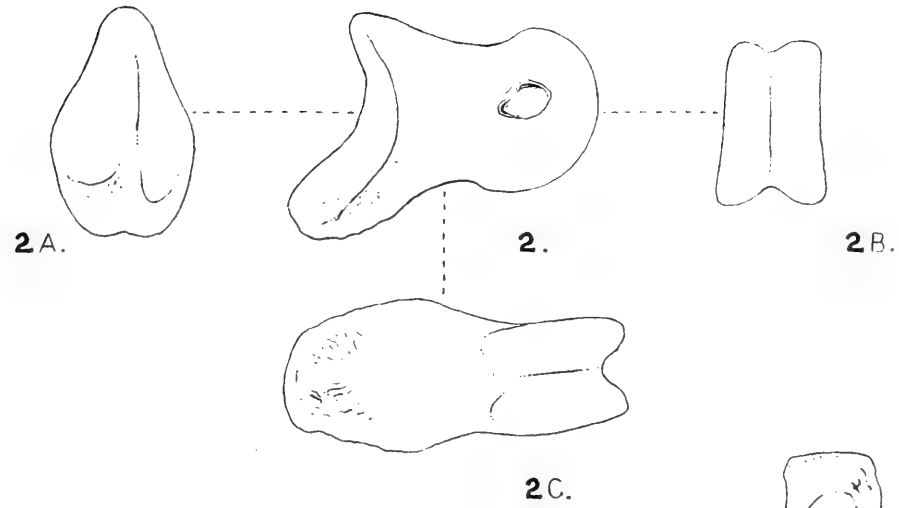
Then, in the teachers themselves some difficulties arose. It was hard for them to forget the habits of years and cease to regard knowledge as the chief object of education. They wished to give information and when directed not to tell too much, in some cases went to the opposite extreme and did not even guide, but turned their classes adrift. Their lack of knowledge troubled them, and in a few instances topics were shunned for fear the pupils might ask questions which they could not answer. In spite of these difficulties, however, the teachers have done remarkably well; and I must express my admiration of the Winnipeg teachers as a body, for having taken up so well, work which was completely foreign to all their traditions.

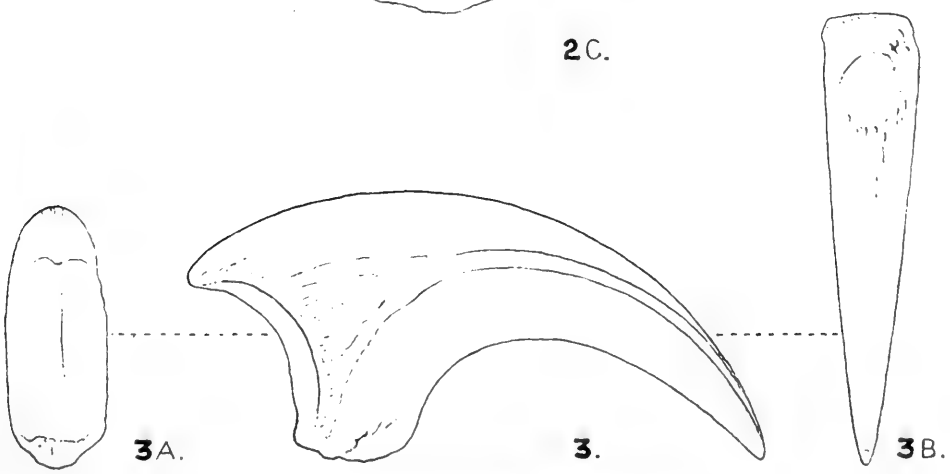
Another difficulty arose with the pupils, in a few cases. They thought they knew all about the topics suggested. "Fancy studying a cat!" They had had one in the house for years. A very little trouble showed them how much they really knew.

Another difficulty was the "parent who didn't believe in such nonsense as studying a butterfly's wing." We heard of a few parents who objected to the work and at the same time showed a consummate ignorance of all about it. However, I am glad to say we received from the parents more encouragement than the reverse.

Last of all arises the question: "What results have been attained?" It is too soon to answer such a question when it is remembered that the work has for its end, not the mere acquisition of knowledge, but the development of interest and mental power; still, I think that results can be seen, for I have asked many times: "Do you see any results?" and have received such answers as: "They see much more;" "They see things they would never have seen before and are always asking questions about something." Surely interest and faculty for observation are things worth working for, and, to those who ask for knowledge as a result, many things can be pointed out as having added to the pupils' stock of facts. We have four months more to work in. If at the end of that time we can feel that the pupils as a whole are a little more interested, sympathetic, observant and self-reliant; and if they realize better that in all things, great or small, animate or inanimate, there is something wonderful, something worthy of study, then indeed our work has not been in vain.







To illustrate Mr. Lambe's Paper.

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NESTING OF SOME CANADIAN WARBLERS.

By WM. L. KELLS, (Third paper.)

THE MOURNING WARBLER.

(*Geothlypis philadelphia.*)

The mourning warbler though not abundant in any district, is yet pretty widely distributed over the province of Ontario, as well as other divisions of eastern Canada, but it is among the last of the family to announce its vernal advent amid the wild scenery of its summer haunts. Usually, when the expanding buds of the lower underwood are bursting into leaves; when the yellow bloom of the leatherwood scents the spring-time air, and the virgin soil of the forests being variegated by the early wild flowers of the season ; the observer of bird migrations, if in the vicinity of its chosen summer home, will be enabled by the sound of its song, to add to his list, this species as among the more recent arrivals from the sunny south ; but as the month of July advances, its nesting period is over ; its notes for the season are silent; and the bird itself appears to be among the first of the members of its family to take its departure from the uncultivated scenery of its summer home ; and begin its aerial voyage towards its tropical winter residence in the regions of Central America. Here it enjoys the pleasure of existence amid perpetual summer, during that portion of the year when its Canadian father-land feels the chilly breath of the ice king, is covered with a mantle of snow, and swept by the wild storms of winter. In March it begins its northward journey, but two months pass away before it reaches the terminus of its winged voyage in the regions of its northern range, and summer home, and here begins again one of the chief objects of its migration movements *i. e.* the propagation of its species, and when the period in which this can only be done is over the impulses

to return towards the south seem strong, and to yield to the impulses of nature in this matter is not long delayed; for by the middle of September, if not earlier, all this species—and its genus have disappeared; though some individuals may linger longer amid the scenery of their summer haunts in the thicket and the swamp, than is now known.

The haunts and home of the mourning warbler, during the period of its residence in Canada, are generally on the margins of low-land woods, or second-growth swamps, where there is an intermingling of young underwood, fallen brush, and raspberry vines. It may also occasionally be found to frequent wooded ravines, the sides of brush-covered hills, and the margins of muddy creeks which meander their courses through what are called "beaver-meadows," where there is deep concealment; and here, amid the deep foliage, one strain of the song-notes of the male of this species, may often be heard, in the mid-summer days, while the little performer itself is invisible. At times he will rise to a considerable elevation, and after a pleasing performance of quite a different series of musical notes, in the ventilation of which he appears to take much pleasure and pride, and during which he makes a rain-bow like circuit, and takes a rapid descent into the thicket below, near where it is probable the female has a nesting place. Another particular haunt of this bird is small clearings in tracts of hard-wood forest, and along the sides of road-ways, through primitive woods: but it is seldom observed out in the open fields, except in the backwood settlements, nor does it often approach the garden or other environments of human habitations, and except where the woods are open, it will not be found deep in the forest, but as the original forests of Southern Ontario are fast disappearing, time will no doubt effect great changes in the summer haunts of this species. In eastern Canada the mourning warbler does not appear to advance further north than the Gulf of St. Lawrence, and the valley of the Ottawa river; but in the western portion of its range—which extends to the foot-hills of the Rocky Mountains—it appears to extend its summer range to more northern latitudes, and higher altitudes than in the east.

Too little is yet known of the nesting history of this warbler to enable the investigator to decide whether it deposits more than

one set of eggs in the breeding season: certainly its nesting period in Canada would not allow of it raising more than one brood during its stay in this country, but where the first clutch of eggs is taken, it will doubtless nest a second time. But, considering the many enemies among the smaller mammals, birds of prey, and reptiles, to which its eggs and young are exposed, it is doubtful if even one brood is raised by the majority of the pairs that cross our national boundary with each return of spring; even in the most protected localities; though the progress of civilization is rather in favor of its increase, except from the presence of the domestic cat; and yet it is wonderful how some nests of our garden—frequenting birds will escape the attention of this feline foe. The chief protective means resorted to by this species is by selecting a deep shady spot, either among the thick herbage, vines or young underwood, on, or near the ground; and then, after incubation has begun, and when the female becomes aware of danger, she does not fly directly from the nest, but quietly runs off among the surrounding shade, and does not take wing till some distance away, nor does she return to her charge till she thinks the danger is over. These efforts to protect her progeny, are, so far as human kind are concerned, so successful that very few of its nests are ever discovered; and its eggs are, and are ever likely to remain, a rarity in oological collections, but the case is very different with the lower orders of carnivorous mammals and snakes which are ever on the search to find and devour the eggs and young of every species that comes within their reach. In this charge the red squirrel, the chipmunk, the weasel, the mink, the skunk, and the fox, are among the chief transgressors that range the haunts of the warblers, while, nearer human habitations, cats, rats, and even mice, do their deadly work; and no enemy of all the warbler family is more to be dreaded than the vagabond cow-bird.

During the past twenty years a number of the nests of the mourning warbler have come under my observations, and the finding of these has been rather accidental than the results of continuous field and forest research; but the last of these noted up to the end of the season of 1902, is the first to which attention will here be directed. On the 8th of June, 1902, when strolling across a piece of recently cleared fallow, now over-grown with raspberry

vines, on the northwest corner of *Wildwood Farm*, a small bird flushed out from a thicket of vines within a few feet of where I was passing. A little research revealed a new-made nest, which I inferred belonged to a mourning warbler; though at the time I had got only a glimpse of the builder; yet, though all the members of this genus of the warbler family compose nests, and deposit eggs much alike, there is always some variation on the part of each species, by which the attentive student of bird architecture can distinguish the owner, even in most cases without seeing the bird, much less without resorting to the crime of murdering the mother, and in this section of country I know of no other member of the family except the Maryland yellow-throat that nests in a similar manner and situation; and even between these near relatives there is a distinguishing difference which will be noted hereafter. This nest was not sunk in the soil, nor yet in the herbage in which the builder evidently desired to conceal it; but its foundation rested on some dry vine stalks elevated a few inches above the ground; and the first strata was formed of dry leaves and vine stalks placed loosely over each other, and not pressed down in the centre, as is the manner of the *Marylander*. On the top of this mass of dead leaves and stalks, and partly supported by the growing vines, the nest proper was placed. This was quite compactly put together, as though the materials were damp with rain, or the morning dew; when used by the builder, and may have been further moistened by the saliva of the bird when engaged in placing the particles together. The materials used were mostly dry leaves, fine fibres of vine stalks, rootlets, and some cattle hair. The inside was about two inches in diameter, by one and a half deep, the top of the nest was quite open, their being no artificial attempt at concealment, as is the habit of the Maryland yellow-throat. Six days after, I revisited this nest, the mother bird was at home and on flushing she did not rise on the wing, but ran off among the herbage in a mouse-like manner, for about 20 feet, when she rose and took a position on the top of a log, about two feet off the ground, and here she remained about a minute, twitching her wings and tail, a peculiarity of this species when excited. She flew off and disappeared in some underwood; but on neither occasion did she utter a note that I could hear, but there was no doubt of her

identity as a female mourning warbler, for parting the canes and viewing the nest I found it contained four beautiful fresh eggs; but I inferred that the set was complete and incubation begun. The general color of these eggs was white, with a rosy blush, but less dotted with reddish brown spots than have been other sets of the eggs of this species previously observed.

Since the early years of our family settlement in the township of Peel, I had been acquainted with the appearance of this species, and acquired some knowledge of its life-habits, for it was almost the only member of its family that made its summer home amid the thick brush-wood, and partly cleared spaces along the banks of the little meandering stream that intersected the homestead farm where I passed my boyhood years, and in those early days of our pioneer life in the Canadian back-woods, it was known to me as "the linnet" for some of the elder members of our family stated that it resembled a little bird called by that name in our native land, and during those early times I often saw its nesting places, but of these I have know only dim recollections. During my nine years residence in North Wallace I failed to identify this species among the avifauna of that section; though I noted several other members of this family that to me were previously unknown. After coming to Listowel in the spring of 1874, and devoting more time and attention to the life-histories of our birds, I soon again recognized my old friend of by-gone years, but for a time I confounded it with another species. In this vicinity I found the mourning warbler to be a tolerably common summer resident, but its presence is usually confined to the margins of certain low-land woods; and one June-time day when investigating the avi faunian life of a certain tract of forest, to the southwards of the town, our dog flushed a female ot this species, which from her notes and excited actions, I inferred had a nest near by; but which at the time I failed to find. Returning some hours afterwards the bird was again flushed, and after a little search, the nest containing five eggs, was found. This was placed in the butt end of a cedar tree that had been uprooted, but from which the earth had fallen away, the site being about eighteen inches above the ground; this nest was a bulky affair, and loosely put together; being composed of dry leaves, weed stems, vines, rootlets and lined with

hair. This was the first nest of this bird that I discovered of whose identity I was certain. Since then a number of the nests of this species has come under my observations, but nearly all of these were placed among growing vines, and mostly raised off the ground, like the one first described. One however, was placed in a clump of sedge grass, growing in low ground that earlier in the season had been covered with water.

In the "Biological Review of Ontario," published by the Canadian Institute in Toronto, 1891, is an article from me on a nest of the mourning warbler taken that season, which I here reproduce.

"On the 28th of May, as I was doing some work on the margin of a swampy burn, and the highland wood on our farm, I discovered in a clump of yellow-topped weeds a newly made nest, of whose ownership I was at first uncertain, as it seemed to be rather large for any of the warblers that nested in such situations. On the 3rd of June this nest contained four eggs, and as the day had passed without one being deposited, I concluded that the set was complete, so I took them, and they are now in my collection. On this occasion the mother bird was seated on the nest which she did not leave until I almost touched her with my hand, and then, instead of flying out, she ran mouse-like into a neighboring brush-pile, which I shook before she flushed to a stand a few yards off, when she uttered some notes and I had no doubt of her identity as a female mourning warbler. The ground color of these eggs is white, and the spotting more of a brownish hue, than either reddish, or black, and one of the set has its marking on the smaller end. The nest itself was rather bulky for the size of the bird. Underneath on the earth was a platform of dry weed stalks; then dry leaves, which had evidently been put together in a moist condition, formed the bottom and the sides of the nest; but the upper rim, and the inside was formed of fibers of vines and grasses, and there was some cattle-tail hair intermingled with the lining."

In 1871, Dr. A. M. Ross of Toronto, published a little work on "The Birds of Canada," which is remarkable as being the first treatise on this subject composed by a resident of Ontario. The following is what he wrote on the mourning warbler. "Its note is a little 'chit,' uttered in a soft, pensive tone; general color, ashy

gray above, and black underneath. Breeds in Canada, nest in a low bush; eggs four, blush white."

In length, this species is between five and six inches. The plumage varies somewhat according to age, and season; but is generally on the upper parts of the body of a bright olive hue, with ashy on the head, below clear yellow, the throat and breast being black, the plumage of both sex is similar.

Listowel, Ontario, Canada.

ORNITHOLOGY.

A WHITE PELICAN AT MANOTICK.

J. F. WHITEAVES.

The Museum of the Geological Survey has recently acquired a fine specimen of the American white pelican, *Pelecanus erythrorhynchus*, which was shot two miles south of Manotick, Ont., by Mr. John Flann, Jr., on the 25th of May last. When shot, it was on a log in the Rideau River. It is a fine adult female in full spring plumage, with the culmen or ridge of the upper mandible of its bill flattened, and entirely devoid of the high, thin, upright comb or crest that is so characteristic of the middle of that part of the bill of the male of this species during the breeding season. The bill was partly pale horn and partly pale flesh coloured, with an orange tip to the upper mandible and a yellow patch round each eye; the pouch was bright yellow, the iris of each eye hazel or dark brown (not white), and the legs and feet bright orange. On dissection, the flesh was found to be inflated everywhere by numerous large air cells, most of the eggs were no larger than a small shot, though a few were as large as peas, and the stomach contained six freshly caught yellow perch about three or four inches in length.

The American white pelican, which was first described by Gmelin in 1788, is an abundant summer resident in the prairie country of Manitoba and the North West Territories, where it breeds in colonies, but it is rare in British Columbia. In winter it is common in Florida, and its course of migration northward is said to be along the great inland rivers, for in summer it is es-

sentially an inland dweller. Macoun says that stragglers of this species are occasionally taken on Lake Ontario and others on Lake Erie, and Chamberlain that "one specimen has been taken in Nova Scotia and two in New Brunswick." But, so far as the writer is aware, this is the first record of its occurence in the Ottawa valley. It was previously represented in the Survey collection by one specimen from Lake Winnipeg, shot by Mr. J. M. Macoun in 1884 and another from Crane Lake, Assa., shot by Mr. Sreadborough in 1896 ; by a series of its eggs, from a small island at the western end of Lake Winnipegosis, collected by Mr. J. B. Tyrrell in 1889 ; and by a large photograph of the nesting place of a colony, at Shoal Lake, Manitoba.

Two other species or varieties of pelican are of much rarer occurrence in Canada, and both of these are of an essentially marine habit.

One of these is the brown pelican, *Pelecanus fuscus*, which was first described by Linnæus in 1766, and which is common in the Southern Atlantic and Gulf States. During the last ten years at least three specimens of it have been shot in Nova Scotia, and one of these is in the Museum of the Survey.

The other is the Californian brown pelican, *Pelecanus Californicus*, two specimens of which, according to Mr. Fannin, have been shot on the coast of British Columbia. It was first described by Ridgway in 1884, and may be only a local variety of *Pelecanus fuscus*.

The "Pelican of the Wilderness," (Kâath) of the Psalms, is the European white pelican, *Pelecanus onocrotalus*, the male of which has no crest to the upper mandible in the breeding season. This species spends the winter in Palestine and migrates to Russia in the summer. Under the Mosaic dispensation, the use of its flesh for food was forbidden to the Jews. A recent writer says of it that the operation of feeding its young is rendered easier by the parent pressing the pouch and lower mandible against the breast, and the contrast of the red hook of the bill with the white of the breast probably gave rise to the poetic idea of the ancients, that the female pelican nourished her young with her blood. From the earliest times the pelican has been the emblem of charity.

MY BIRDS AND HOW THEY CAME TO ME.

It was my good fortune to spend the coldest week of this winter in a small New Hampshire town on the bank of the Connecticut River. The thermometer stood at 25° at breakfast time; the days were sunny, the air was still, and the moon at the full; all this with an unbroken level of fresh snow made winter a delight to one "who likes that kind of thing."

Sparrows were not to be seen at our end of the town, but chickadees, white-breasted nuthatches, pine grosbeaks and downy and hairy woodpeckers were more or less common visitors. A sheltered corner of the verandah had been wired in below by way of protection from cats and in this corner was a large wooden trough filled with dried sun-flowers, while suet hung from the trees and shrubs near by. To the sun-flowers came flocks of chickadees, with an occasional nuthatch, in and out the live-long day. I watched them with delight and came home to try my hand at feeding birds in Cambridge.

On the south side of the house stands a willow-tree whose long boughs reach out in all directions, making in summer a forest of green, where birds of various kinds find camping ground. There have been crows, robins, grackles, rose-breasted grosbeaks, pine grosbeaks, white-breasted nuthatches, chickadees, brown creepers, flickers, downy woodpeckers, humming birds, song sparrows, chipping sparrows, redstarts, cedar birds, vireos, summer yellowbirds, orioles, blue jays, golden-crowned kinglets, goldfinches, cuckoos, and once—A day to be remembered!—one of the maids came breathless to my door.

"Please, Miss, John wants you to look out of the window to see a bird."

"What is it, John?" I said.

"Well, it was the reddest bird I ever seen. I was watering the purple beech and he came and bathed in the pool; but now he's gone."

"Don't you think it was a robin?" I asked in exact imitation of my own Bird-man, who generally calls all my new birds English sparrows.

"Robin?" repeated John, "Well, no, it wasn't a robin. As if

I didn't know a robin!" muttered the exasperated observer ; and sure enough, as I stood at the window, still thinking, "it was just a robin," suddenly there lighted on the willow bough almost within touch, "the reddest bird *I* ever seen."

"Do I look like a robin?" he asked.

"No, not in the least," I answered. "You beautiful scarlet tanager!"

All these birds have at various times perched on the willow-tree, but until this year I had never thought to feed as well as shelter the winter guests.

The first venture was in suet ; cutting pieces as large as my fist and tying them to a long string I threw them from my bed-room window over the nearest willow bough fastening the string to the window-sill so that the suet was quite under control. At the end of a week the chickadees were literally in full swing.

I next bought a peck of sun-flower seeds and scattering them on a drawing-board I put the board on the window-ledge shutting down the sash to steady the board. In three days the chickadees were on the board. I then bought a plaster-cast of a hand and arm, filled the hand with seeds and put it on the window-ledge. The birds came to the hand. Finally I put out my own hand with seeds and in two minutes a chickadee was on my hand. No one who has not tried it can know the pleasure of feeling the little feet of a wild bird clinging to one's finger. Since then the chickadees have come to me every day, even flying about the room,—this, however, is accidental and not always agreeable to them ; one however made himself quite at home, flew from one spot to another without dismay, and at last perched on the top of the door, and when I reached up my hand he hopped upon my finger and let me carry him to the window. A basket full of sun-flower seeds and chopped raw peanuts stands on the window-ledge and to this come the nuthatches as well as the chickadees ; but they are not so tame and although one comes to me and flutters over my hand, its courage fails it at the last and it darts back to the willow bough and cries "yank, yank," until I draw back my hand, and then it flies to the basket and looks up in my face quite at its ease. A woodpecker has been at the basket ; the kinglets poise under the suet, and once I saw a goldfinch hanging on it.

In February we had a small flock of pine grosbeaks feeding on the privet berries and on rotten apples thrown on the ground, a flicker also came every day for the apples. In trying to hang an apple on the willow bough for the grosbeak I miscalculated the length of the string, the apple fell short, rebounded and broke the dining-room window. The glass was mended, I tried again, and an apple hung oddly enough from a winter-bare willow bough, and I sat me down to wait for a grosbeak. In a few minutes a great gray squirrel ran up the tree and in clawing the apple he tipped it over the bough and it hit the window again: this time, however, without any castastrophe. Probably a squirrel cannot throw as hard as a woman. After that the apples lay on the ground, or rather on the snow, for until quite lately there has been no "ground" to be seen.

Now that the snow has almost gone and the birds are finding food elsewhere, they come less often to my window, but the pleasure of having had them will be a joy forever.

M. E.

Cambridge, Massachusetts,
March 22, 1904.

SUB-EXCURSION TO BLUEBERRY POINT.

The Ottawa Field Naturalists' Club held its second sub-excursion for 1904 to Blueberry Point, Aylmer, on May 7th. About 150 persons were present, the Normal School and the Ottawa Ladies' College being well represented.

The Trailing Arbutus (*Epigaea repens*) was very abundant and eagerly collected. The banksian, red and white pines were observed and *Viola cardaminefolia* and *V. subviscosa*, collected in good condition.

At the close of the afternoon's work Dr. Sinclair assembled the party and called for addresses from the leaders present. Mr. W. J. Wilson illustrated by means of a map the geographical formation of the district, and gave some valuable hints to those commencing field work in geology. He pointed out that the unusually high water of the Ottawa River had covered all the shore

material and prevented his section from doing any work in the usual locality. Messrs. Gibson and Young reported the season a backward one, as they had taken very few species of insects. Two species of butterflies, the Spring Blue and the Early Native White were observed for the first time this year.

Rev. Dr. Blackader and Mr. Clarke spoke of the plants found. Dr. Macdonald, M.A., drew attention to the benefits to be derived from an outing with the Field Naturalists' Club, and expressed his appreciation of their work.

BOTANICAL NOTES.

ALUM ROOT AS A REMEDY FOR DIARRHŒA.

An interesting note on the medicinal value of Alum-root, (*Heuchera hispida*, Pursh) has been sent in by Mr. W. McCarthy of Rat Portage, Ont., who writes : "I was out prospecting with two white men (Mr. Moore and Mr. Walters) and an Indian. The two former were taken sick with severe diarrhœa for three days. The Indian left camp and went to the bush and got some of the plant I send you. He gave each of the men about an inch of the root to chew and swallow the juice. It acted like magic and the next day they were quite recovered. I have since had some of the root pounded fine and put a little water on it and boiled it up with sugar. I then strained it and have given it to several infants for cholera infantum and it has proved successful. The plant is abundant here and I have given it to several who have also used it successfully." The closely allied *Heuchera Americana*, *L.*, is known to be a powerful astringent.

J. FLETCHER.

NATURE STUDY—NO. XIV.

SOME UNDERLYING PRINCIPLES, METHOD AND SYSTEM OF NATURE STUDY.

C. W. G. EIFRIG.

Most educators, and people of alert mind generally, have come to recognize the usefulness and even necessity of Nature Study for people in general and the young in particular. I hold that to study and know something about nature and the objects in it, among which we live, which we see, hear and are brought in more or less close proximity to, is as useful and profitable for a person as some of the branches of science and art hitherto taught in schools and colleges to the exclusion of everything else. For instance, if we learn at school, where a certain city or river is situated in the world, which we shall perhaps never see or even hear of again, it is just as valuable to know where certain trees and plants grow, especially in our neighborhood, and why, and where the different individuals or families of living things stay and where they do not as well as for what purpose. If we read in history of the irruptions of, say, the Huns into Europe and their defeat A.D. 453, or of the imigration of the Anglo-Saxons into Britain 449 A.D., etc., it is just as important and valuable for people to know about the irruption and migration, the appearance and disappearance of insects, birds, mammals, fishes, plants, etc., which may affect our lives favorably or unfavorably, destroy our crops or trees, or help us to overcome such pests, etc. If we derive endless pleasure by studying the gems of thought and diction in literature, why overlook the gems of God's own handiwork in His mineral, vegetable and animal kingdoms surrounding us! And these can be found and enjoyed not from dusty books, but out in the sweet-scented air and healthgiving sunshine. If a person not used to it, once tries to see and observe things in nature, he will soon find how little he is able to see and hear and differentiate correctly, how little he can use his senses properly, showing that while his head may be crammed full of book knowledge, his faculties to rightly observe things near him have been neglected, and he will perceive, that, though he knows a good deal about things far removed from him by space or time, he knows little or nothing

of things surrounding him, of which he perhaps makes daily use or could do so, and from which he might be able to derive enjoyment if he were able to understand, know or at least properly observe them. So, there can be no difference of opinion as to the usefulness and necessity of Nature Study. But, regarding the ways and means of it, there is as yet no concurrence of opinion. And it is the object of this paper to state some underlying principles for Nature Study as the writer conceives it, whether it is carried on professionally or in an amatuer-like manner, and whether much or little time can be devoted to it.

In the first place, Nature Study must not be looked upon and taken up as a *fad*. Ours is eminently an age of fads. Faddism is carried into every branch of human activity. If one takes up Nature Study, or any other study, as a fad, as a passing whim of fashion, as an affectation of some people, he or she thereby debases such study, debauches the mind and intellect, and squanders time and money No, it must be looked upon as a study requiring earnestness of purpose, all powers of mind and body while carried on, devotion and application to it, also patience and resourcefulness. Whoever does not want to undertake Nature Study in this way, had better not begin it at all, or at least not call his weak dabbling with science and nature or his more or less purposeless rambles, Nature Study.

As is necessary in most undertakings of men, a student of nature must not begin his work at random, in a purposeless and ever-shifting way, but there must be method and system in his work, be this much or little. To attempt to carry on Nature Study without this would be as foolish as trying to build a house without plan or fixed idea. As a few most necessary principles underlying the system and method of the study of nature, I would submit these, viz.: *Limitation*, *concentration*, *exactness*, and after all this, the making *accessible* to others of the results.

So, first, there is *limitation*, *i. e.* that a student of nature, professional or otherwise, confines himself to certain limited areas of investigation of objects offered us by nature. Life is too short, even for one who can give *all* his time to this, to take up all the fascinating problems that ask for solution in the realm of nature. So, if a lover of this study would plunge himself into it headlong,

try to begin everything, and follow all lines of investigation, he would soon be hopelessly stranded and become disgusted at the impossibility of his undertaking. One should rather take up a small area, the smaller the less his time is, and he may obtain gratifying results. If you cannot take up botany entire, or dendrology, or herpetology or ichtyology, etc., take up a small item in one or more of these, *e. g.* the study of mosses or lichens or mushrooms, or begin with a family of trees or birds or fishes or insects. There are few, even among the most common insects or birds or mammals, whose life history is entirely and completely known.

Furthermore there is *concentration*, in which must be included thoroughness and patience. One must concentrate his mind on the chosen study, and give it his best efforts. He must not be superficial but thorough in his observations. He must not jump at conclusions. That is extremely dangerous. Science does not want it, although many scientific men indulge in it. Science is derived from the Latin *scio*, to know; it must deal with *facts* only. So, painstaking, laborious investigation and observation is wanted, not half-observed phenomena and guesses. Sometimes an infinite amount of patience is required. Think of John Burroughs digging away two or three tons of earth in order to understand the ways of a weasel's underground home! Or Audubon, now in the far west, now in Labrador, now in the limitless forests of Kentucky or the impenetrable mangrove thickets of the gulf coast, in heat and cold, observing, sketching, recording. If a bird or insect with which one wishes to become acquainted flies into a thicket or swamp, it will not do to remain outside; it means to follow it up at the risk of ruffling one's clothes and temper.

Coupled with thoroughness must be *exactness*. A student may be thorough, not spare himself labor and exertion, and yet not be exact in gettting at his results or recording them. If he sees a certain damage done to a plant by insects, and finds an insect on the plant, it would not do to assume that this is the author of the harm until he sees it at work. The same holds good in all other branches. One must have a sense of responsibility, feeling that by inexactness he may cause people to believe and circulate untruth, which would always be harmful, leaving aside the moral issue.

And last but not least, a conscientious, patient, systematic student of nature should consider it his duty *to make the results of his labors accessible* to others, to science in general. If a per-

son has found out one fact concerniug any mineral, plant or animal, large or small, a fact not known before or disputed, and is certain of it, he contributes to the sum of human knowledge by having it printed in some suitable medium of communication between scientific men, or where they can find it. At least let him give his notes to some such person who is able to apply the fruit of his labors to wider usefulness.

Now, after reading this, some ardent lover of nature who thought of becoming an amateur student of it, may say to himself, well, this rules me out of Nature Study; I have neither the time, nor the money, nor the scientific attainments of the mind to carry it on in this wise. But hold on! The underlying principles here mentioned, namely limitation, concentration, exactness and the making the results of your observations accessible to others, does not necessarily require all one's time, or much money and great scientific knowledge. There are people who have contributed largely to the sum of human knowledge who were busy men and did not have much leisure time and remained in their occupation throughout their life, one, a fellow of the Linnaean Society, London, remaining a cobbler to the end of his days. Nor must you think that only startling discoveries are valuable to man. No, many little, but correct observations round out the sum total of human knowledge just as surely and effectually. And how many great discoveries etc., have been begun in a small way! Look at James Watt, pondering over the phenomenon of the escaping steam from the tea-kettle lifting up the lid. By following this up, he became the inventor of the steam engine. The lawn in front of your house may harbor an insect new to science. Novices in astronomy have discovered new stars. Tenacity of will-power counts for most here, whether one has little or much time. And even if you can not achieve any results satisfactory to yourself, you will at least get into closer touch with nature, your powers of the senses will be whetted, you will see and hear more beautiful things than people who have no eye or ear for them, though they live right amongst them. It is a thing of beauty and a joy forever to observe the ways of living things in field, woods and meadow; to see the wise adaptation of means to certain ends and to behold the beauty of design and finish in even the minutest specimens of God's handiwork in nature. And then, there is the healthfulness of it! Pure air and sunshine are by far the best preventive and curative medicines in the world. And while taking them in, it is better to have some object in view, to engage the mind somewhat, else it will soon become tedious. And that something ought then to be one of the fields of Nature Study, even though a much restricted one must be chosen.

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ON THE SQUAMOSO PARIETAL CREST OF TWO SPECIES OF HORNED DINOSAURS FROM THE CRETACEOUS OF ALBERTA.

By LAWRENCE M. LAMBE, F.G.S., F.R.S.C., (With two plates.)

One of the most interesting features of the fauna of the Belly River series of the Cretaceous of the West is the presence of Ceratopsids more primitive than those of the Laramie. Of the former the writer, in the second part of volume III (quarto) of Contributions to Canadian Palæontology, 1892, described three species of *Monoclonius*, viz. *M. dawsoni*, *M. canadensis* and *M. belli*, all from the Red Deer river district. In a further study of the type material on which *M. dawsoni* was founded, it became apparent that two species had been included under one name and also that the species distinct from *M. dawsoni* probably represents a new generic form. The material denoting the new genus and species, and originally referred to *M. dawsoni*, consists of a large posterior crest (p. 59, fig. 15, op. cit), with which was found a nasal horn core. This crest is unique in having hooked-processes developed on the posterior border.

For the form represented by the crest with hooked-processes the generic term *Centrosaurus* is proposed and the name *apertus*, in reference to the large fontanelles, is deemed an appropriate one for the species.

In a paper by the writer, to be published shortly, a detailed description with figures will be given of the posterior crest of *Centrosaurus apertus* as well as of that of *Monoclonius canadensis*. The skull, described in the above mentioned memoir, p. 57, fig. 14, cat. No. 1173, is retained as the type of *Monoclonius dawsoni*.

The fontanelles of the crest of *Centrosaurus apertus* are included entirely within the parietal part of the expansion, those of *Monoclonius canadensis* are bounded on the outer side by both the parietal and the squamosal.

The crest of *C. apertus* is composed principally of the coalesced parietals which form an expansion having somewhat the shape of a saddle, broader than long and much more robust posteriorly than in front where the bone is decidedly thin. The squamosal is not known. The parietal part of the expansion, figures 1 and 2, plate I, is longitudinally ridged in the median line, is broadly expanded laterally on either side, and ends posteriorly in a robust transverse bar that is concave in outline behind as viewed from above. The fontanelles occur one on either side of the median line and are of large size; they are bounded behind by the transverse bar that forms the posterior border of the crest, and laterally and in front by the thin side extensions. Along the median line the bone is transversely concave beneath. The separate ossifications, named by Marsh epoccipitals, are well developed in four pairs, with in addition the pair of hooked-processes, already mentioned, which are regarded as specially developed epoccipitals. The alar extensions are referred to in the original description as the squamosal portion of the crest, the squamosals being then regarded as having coalesced with the parietals. Near the anterior border of the right extension, however, there is a definite line of demarcation, *a*, figures 1 and 2, which can be considered only as the suture for the squamosal. The writer's attention was drawn to this suture, and to the wrong interpretation in the original description of the nature of the side extensions, by Mr. J. B. Hatcher, Curator of the Department of Vertebrate Palæontology of the Carnegie Museum, Pittsburgh, who, with his intimate knowledge of the *Ceratopsidæ*, is justly regarded as one of the foremost authorities on this interesting family. The postfrontal suture, *b*, figures 1 and 2, extends from the inner side of the anterior end of the fontanelle obliquely forward and inward to the median line in front. Numerous impressions of blood-vessels are present on and in the neighbourhood of the epoccipitals and hooked-processes, and on the upper surface along the median ridge. The thickness of the bone at a number of points, is indicated in centimetres by the numerals in figure 1.

The horn core, figure 3, found with the crest is presumably a nasal one. It is straight, and laterally compressed so as to be lenticular in cross section presenting a sharp edge to the front and rear. A somewhat similarly shaped nasal horn core has been described by Cope under the name *Monoclonius sphenocerus*. One side, that figured, is deeply channelled longitudinally, the other is more regularly convex ; vascular markings are conspicuous on both sides. There is apparently no great distortion, if any, of the specimen, which is 30 centimetres long and imperfect at the tip and below.

We may conclude from the above that *Centrosaurus apertus* had a broadly expanded squamoso-parietal crest composed mainly of the coalesced parietals, the squamosals being confined to the antero-lateral edge of, and taking but little part in the formation of, the frill. That the large oval fontanelles were included entirely within the parietal part of the expansion and that epoccipital bones were well developed, of which the hinder pair were greatly modified so as to form large hooks or spurs of bone on the hinder border. That a closely fitting integument was present, as is indicated by the many impressions of blood-vessels on the upper surface, with the probability that the projections of the periphery at the sides and behind were sheathed in horn.

The squamoso-parietal frill of *Monoclonius canadensis* is represented by a well preserved right squamosal, figures 4 and 6, and part of the parietal, figures 5 and 7. With these were found other parts of the skull, to which reference has been made in the original description.

The squamosal is plate-like, somewhat triangular in shape, with the apex of the triangle directed backward. The inner border is concave in outline, the outer one convex and scalloped. The front border has two deep emarginations in its outer half ; in the inner half are the sutures for the jugal and postfrontal. Its upper surface is smooth. Beneath is a deep pit, *c*, figure 6, which received a process from the quadrate, and at a slightly lower level the outer end of the exoccipital probably effected a junction where the broken surface is indicated at *d*. A shallow groove, *f*, figures 6 and 4, extends from the raised surface for the exoccipital to and over the inner border to the upper surface where it ends; it becomes deeper and narrower near the border. There is a wide triangular excavation in the inner front portion of the lower surface with indications that the bone here overlapped the postfrontal to some extent, the contact with the jugal being limited to a small surface which would include the marginal pit shewn in figure 4 at *e*.

The parietal reached the squamosal from behind by means of an attenuated lateral extension of which only the anterior extre-

mity is known. This part of the parietal is keeled below, figure 7, and is triangular in cross section, with a flat upper surface, figure 5, that fits into a shallow groove along the inner posterior border of the lower surface of the squamosal as shewn by the dotted lines in figures 4 and 6. Its free outer border behind continues the sinuous curves of the outer border of the squamosal. The parietal portion of the crest of this species may have had some resemblance to the coalesced parietal bone, the only known part of the crest, of *Monoclonius belli*.

On the inner side of the squamosal and the forwardly directed posterior extension of the parietal was an opening in the crest of great size much larger probably than the parietal fontanelle of *Centrosaurus apertus*.

From the foregoing it is seen that the posterior crest of *Monoclonius canadensis* extended far back, that it was made up of the parietals (probably coalesced and bearing some resemblance in form to the corresponding portion of the frill of *M. belli*) and the squamosals, the latter entering largely into its composition, and that fontanelles of very large size were present. We find also that the fontanelles were not included entirely within the parietals, as in *Centrosaurus apertus* but were bounded laterally in front by the squamosals.

EXPLANATION OF PLATES.

PLATE I.

Figure 1—Coalesced parietals of *Centrosaurus apertus* viewed from above; one-eighth natural size.

Figure 2—The same, viewed from the right side and similarly reduced.

Figure 3—Lateral aspect of nasal horn core of *C. apertus*; one-eighth natural size.

PLATE II.

Figure 4—Right squamosal of *Monoclonius canadensis*, exterior view; one-sixth natural size.

Figure 5—Upper surface of front end of right lateral posterior extension of parietal of *M. canadensis*; similarly reduced.

Figure 6—Interior view of the squamosal shewn in figure 3; similarly reduced. The dotted line in this figure and in figure 4 indicates the position of the parietal extension when applied to the squamosal.

Figure 7—Lower surface of the bone shewn in figure 5; similarly reduced.

THE MOUNTAIN BLUEBIRD IN MANITOBA.

By NORMAN CRIDDLE, of Aweme, Man.

In an interesting paper on "Rare Manitoba birds," read before the Historical and Scientific Society of Manitoba, on February 9th, 1904, by Mr. G. E. Atkinson and published in the Manitoba Free Press, mention is made of two Mountain Bluebirds (*Sialia arctica*) having been seen in October, 1896, near Brandon, one of which was shot. These are apparently the only records of the bird's appearance in Manitoba, excepting a few notes on their migration sent by me to the United States Biological Survey.

This bird is, however, by no means uncommon in the tract of country lying between this place and Carberry—known locally as the "Sand Hills" or "Spruce Bush"—and it seems probable that, when its favourite haunts are more generally known, it will be found in several of the more hilly parts of the province.

The "Sand Hills" mentioned above consist of low sandy hills, very often with blow-outs on their south sides and underbrush on the north. These hills, which seldom rise more than forty feet above their bases, usually contain on their tops and sides—when protected from fire—clumps of spruce, and between their ranges—that contain an occasional pond—grow aspen, willows and a few stunted oaks, etc.

These oaks which are often hollow, in company with a few old stumps that have been previously used by woodpeckers, make ideal nesting places for the bluebirds, and any person in search of them during the latter half of June, would probably find several nests in a day.

Of the numerous nests examined by me, some were more than nine feet from the ground, the average being just under four. They were built of dead grass and contained, when the birds had finished laying, six eggs, which closely resemble those of *S. sialis*, excepting that they are smaller.

The reason that these birds are not more generally known in Manitoba, seems to be their habit of seldom flying far from their breeding ground. As an instance, I have lived within five miles

of their nesting places for over twenty years without seeing one here.

My migration notes are unsatisfactory. The earliest arrival was noted May 7th, 1900, the last noted being October 14th, 1899, and October 16th, 1900. These dates could probably be extended both ways, as they are taken after only a few hours spent in the "Sand Hills" with long intervals between each visit.

For the benefit of readers that are not acquainted with the different bluebirds of North America, the following distinguishing features of our Canadian species may prove of interest:

BLUEBIRD (*S. sialis*). Male: above azure blue; throat and breast rusty brown; belly whitish. Female: blue of back more grayish brown; breast less rusty. Male in winter much the same as female.

WESTERN BLUEBIRD (*S. mexicana occidentalis*). Male distinguished from *S. sialis* by having rusty brown on fore back and the throat blue. Female duller. The range of this species is given in Chapman's Colour Key, as "Pacific coast from Northern Lower California north to British Columbia," etc.

MOUNTAIN BLUEBIRD, (*S. arctica*). Male: above bright blue; throat and breast rather paler; belly whitish. Female: above bluish gray, with very slight brownish tint; rump blue; throat and breast bluish buff; belly white. The specimens observed closely by me seem to be distinctly bluer than the description in Chapman s Colour Key. This species is said to breed from "Sierra Nevada east to the plains, and from New Mexico north to the great Slave Lake region."

There is practically no difference in the length of these three birds.

NOTE ON THE FOOD VALUE OF CERTAIN MUSHROOMS

By FRANK T. SHUTT.

In the minds of most of us, no doubt, mushrooms are regarded rather as a delicacy than as an article of food. Their peculiarly agreeable and somewhat piquant flavour when properly prepared and carefully cooked has established for many species of edible fungi a world-wide reputation for the making of ragouts, sauces, and as "flavourers" generally; but, speaking broadly, most have failed to recognise their highly nutritious character. Their price in city markets is undoubtedly out of all proportion to their value as food, but we must conclude that the well-nigh general neglect to gather and use them in districts where they occur in abundance, is due chiefly to ignorance of their nature from the standpoint we are now considering them.*

Analysis shows them to be characterized by a comparatively speaking large percentage of nitrogenous matter (crude protein), a considerable proportion of which exists in the form of true protein or albuminoids. The function of this latter class of constituents of foods is to repair the daily waste of the body and build up its tissues, and hence the proteids are commonly known as flesh-formers, and are consequently to be regarded as the most important of the nutrients, whether in animal or vegetable foods.

Last autumn, in order to obtain data that might be of interest in this connection, a partial analysis was made of certain species that are found in abundance on the lawn of the Experimental Farm, Ottawa. These comprised the Fairy-ring Champignon (*Marasmius oreades*), the Grey Coprinus or true Inkcap (*Coprinus atramentarius*), and the Shaggy Coprinus or Horse tail Mushroom (*Coprinus comatus*), commonly known as "Umbrellas". The results are as follows :—

*There are, we know, many persons who have a dread of all fungi, for fear of being poisoned, and it is only natural that they should hesitate to avail themselves of these nutritious delicacies.

Collected Oct. 14th., 1903.	Dry Matter. per cent.	Crude Protein. per cent.
1. *Marasmius oreades*, mature ...	10 15	4.07
2. *Coprinus atramentarius*.	5.67	1.37
3. " *comatus*, immature...	9.10	2.97
4. " " mature... .	6.77	2.71
5 " " old, but firm	6.14	1.36

In the case of the *Marasmius*, it was found that 70 per cent. of the crude protein was present as albuminoids. Of the crude protein in mature *C. comatus* (No. 4), 68 per cent. existed as albuminoids, a percentage that was reduced to 48 in the older specimens of the same species (No. 5). Unfortunately, by reason of insufficient material, the proportion of albuminoids in the crude protein of Nos. 2 and 3 could not be determined.

When it is pointed out that but few of our commonly used vegetables and salad plants contain more than 10 per cent. to 11 per cent. dry matter—and many of them, as vegetable marrow, celery, lettuce, cucumbers, &c., do not possess much more than half such an amount—it will be obvious that mushrooms are worthy to rank with these most useful articles of diet. But it is not merely in dry matter that the edible fungi make their claim to recognition as a food. This dry matter is highly nitrogenous. Our data on this point are very clear. Further, these analyses indicate that the greater part of this nitrogenous matter exists in the more valuable form of albuminoids. In this respect, mushrooms are without doubt much superior to vegetables and fruits.

If time permits, this work will be continued during the coming season. There are many other species of edible fungi in abundance, in addition to those mentioned in this note, and we hope, as opportunity offers, to ascertain their relative food values. We, further, wish to examine these mushrooms at various stages of growth, for the results from the *C. comatus* here given would indicate a falling off in nutritive value after reaching a certain degree of edible maturity, due to decreasing dry matter and albuminoids. This may only occur in the deliquescent fungi, but it will be interesting to have further data upon what must be considered a point of both scientific and economic importance.

Laboratory, Experimental Farm, Ottawa, May 1st, 1904.

GENERAL EXCURSIONS.

The Ottawa Field Naturalists' Club held the first general excursion to Casselman on May 21st. The president, Mr. W. T. Macoun, was in charge, and leaders in various branches of the Club's work were present, but the heavy rains of the preceding days limited the attendance to a few members of the Club.

The collecting field at Casselman is a most varied one, and the different sections soon separated for the day's work. Dr. Ami took a party along the bank of the Nation River, and they were successful in unearthing numerous relics of the South Nation Indians, an Algonquin tribe whose name is borne by this tributary of the Ottawa river.

Dr. Fletcher, Messrs. Gibson and Young led the entomological section and secured many specimens of insects, among them 10 different species of butterflies. *Thecla niphon* was, perhaps, the rarest of these. This is a small brown butterfly the caterpillar of which feeds on the young shoots of pine trees. A specimen of the rare beetle *Hylecœtus lugubris* was seen on the railway track and was caught but made its escape. Several specimens of *Sphœridium scarabœoides* were secured.

The ornithologists found that both locality and season combined to furnish ideal conditions. No less than forty-nine species of birds were observed by Rev. C. W. Eifrig. The Greater Yellow-legs and the Black-bellied Plover were both seen along the river. A Migrant Shrike's nest with five young and one egg was found. The nest was placed on one of the lower branches of a plum tree. A Bluebird's nest with 5 eggs and a nest of the Savanna Sparrow were also seen.

The botanical section found several species that are not of common occurence near Ottawa. Four species of *Trillium* were collected, the rarest being *Trillium cernuum*. *Trillium grandiflorum* with exceptionally large flowers was common. In some of these the white petals from the base to the open measured 2½ by 1½ inches wide. Specimens in one clump were semi-donble and had in some instances the sepals petaloio and more or less white. Some violets were in splendid condition. *Viola brauda* was remarkably fine and in such enormous abundance as to scent the

air. *Viola affinis* grew in the crevices of the rocks beside the river. In a creek bottom *V. cucullata* was very beautiful. *V. prionosepala* was also collected at the edge of the woods as well as *V. Dicksoni*. *Corylus Americana* was added to the flora of the district, by Prof. Macoun. Dr. Fletcher found an interesting hybrid between *Osmunda claytoniana* and *Osmunda cinnamomea* growing in a clearing where both of these ferns were very abundant. The strawberry blossoms (*Fragaria Virginiana*) presented a strange appearance in one place ; the petals were modified so as to bear anthers at their tips, and could be seen in all stages of transition from petals to anthers. Although spring only began on the 1st of May, this season's growth has been very rapid.

The Ostrich Ferns in the alluvial soil of the river bottom were fully five feet in height, and so dense as to resemble a picture of tropical vegetation. *Phlox divaricata* was found; but the splendid beds of this beautiful flower which formerly occured on the south bank of the river have been almost destroyed by the forest fires—On the north bank clumps of *Rudbeckia laciniata* were found in one spot. The only land shell of interest was *Helix Sayi*.

The SECOND GENERAL EXCURSION was held on May 28th to Gilmour's Grove, Chelsea. Through the kindness of Messrs. Gilmour and Hughson, the beautiful grove overlooking the grand rapids on the Gatineau River was thrown open to the club, and about 200 members and their friends took the opportunity of again investigating this rich locality. The day was simply perfect for such an outing, and many interesting specimens rewarded the collectors. Mr. Arthur Gibson and Mr. D. A. Campbell captured many insects of interest; among these, *Thecla niphon*, *Amblyscirtes samoset* and *Nisoniades juvenalis* may be mentioned. The botanical treasures as usual were most numerous among the collections. *Cypripedium acaule* was found in small numbers; other orchids exhibited at the end of the day were *Orchis spectabilis* with the whole flower purple, and *Habenaria Hookeri; Viola prionosepala* carpeted the woods in one place. A prize offered for competition by Miss Cowan for the largest number of species observed, was won by Miss Constance Anderson. Several ferns were collected, and Miss K. Lee exhibited fine plants of *Woodsia Ilvensis*, and *Asplenium Trichomanes* Dr. Fletcher showed a specimen of *Botrychium matricariæfolium*, of species which had only once before been found in the district, at Casselman, many years ago.

At 5 o'clock the President, Mr. W. T. Macoun, called the meeting to order and the usual addresses were given. Mr. Macoun spoke shortly of the objects of the club and urged the claims of the club for more general support by all interested in Natural History and Nature Study. He spoke also of some of the trees growing in the locality. Dr. Fletcher spoke of some of the plants collected and gave information about specimens handed in.

Mr. D. A. Campbell spoke of and exhibited some of the insects collected during the afternoon and dealt with the habits of tiger beetles, dragon flies and other insects, also with the methods of collecting, killing and preserving insects.

Dr. S. B. Sinclair spoke of the pleasures to be gained from such meetings as the club gave opportunities for, and at his request the party had the pleasure of hearing the ladies and gentlemen of the Normal School present sing "Sweet and Low," which was done with great taste and was much enjoyed by all.

Mr. Congdon, of Malone, N.Y., on invitation of the President, expressed his pleasure at being a participant in the excursion and of the value of Nature Study to which he had given some attention in his professional work as a teacher. T. E. C.

CONCHOLOGICAL NOTES.

MARGARITANA DELTOIDEA.

Some years ago, while looking over a box of "dead" shells collected in the Rideau Canal above Hartwell's Locks, I was surprised to find among them a single specimen of *Margaritana deltoidea*. Although the species might from its known range be expected to be found in the vicinity of Ottawa, I concluded, as I had not observed it previously, that the specimen must have been placed with the canal shells by the busy but unscientific little hands that occasionally find occupation in my cabinets. I was confirmed in this conclusion by the fact that a search, made under favorable conditions in the locality in which the box was collected, was fruitless so far as this particular species was concerned.

Last summer, however, while trout fishing on the South Branch of the Quyon River, near Thorne Centre in the county of Pontiac, I found a living example—and but one—of this interesting little pearl bearer. It may occur in other places near Ottawa, and is, I am now inclined to think, to be found in the Rideau Canal.

In any case it should be added to our list as occurring in the Quyon. In outward appearance it resembles a small specimen of the common brown clam, *Unio complanatus*.—F. R. L.

INTRODUCED MOLLUSCA.

It is well known that the eggs of many species of mollusks, as well as the mollusks themselves, are highly resistant to heat and cold, and that some endure desiccation extending over long periods of time. The eggs are frequently deposited among the roots and stems of grasses and plants. Several species have been widely distributed in the straw used for packing articles shipped from Europe to this country. I have no doubt that *Helix cantiana*, which abounds at Quebec in restricted localities near the Citadel and the Observatory, originated in the packing material thrown over the walls of the fortress and on the declivity above the Cove Fields. Two notable importations were brought to my notice some time ago. One was the large European slug, *Limax maximus*, L., which was found by Mr. Scrim in one of his conservatories at Ottawa. The animal had an extent of over four inches, and would in large numbers be very destructive. Fortunately it occurs but rarely and is easily seen. But the other, *Zonites alliarius*, is a much more serious pest. It is minute in size and occurs in considerable numbers. Mr. Scrim finds it chiefly in the greenhouse devoted to the cultivation of palms, ferns and selaginellas. The lace-like traceries wrought on the under surface of a leaf betray the presence of the tiny operator and result in his destruction. When crushed by the horny-handed toilers in the greenhouse, the animal gives forth with its dying breath a strong and surprisingly permanent odur of garlic. Hence the specific name—*alliarius*, L.—F. R. L.

I have received from Mr. G. A. Knight, of Mount Tolmie Nurseries, Victoria, B.C., specimens of this European Mollusk which he has found in some numbers in his greenhouses.—J. F.

NATURE STUDY—No. XV.

HOW TO COLLECT AND PRESERVE PLANTS.

By W. T. MACOUN, Horticulturist, Central Experimental Farm, Ottawa, Ont.

While Nature Study does not necessarily involve the accumulation of natural history specimens for the purpose of forming a herbarium, a collection of insects or of bird skins, the making of a collection is undoubtedly of great value both as a means of bringing the student into closer contact and more intimate acquaintance with natural objects, and of inducing a continued and well directed study of them. If one decides to make a collection, it is of the greatest importance that he begin in the right way. It frequently happens that young people, and adults as well, in their enthusiasm, begin collections ; but, through ignorance of the best methods of collecting and preserving their specimens, these are improperly made, or, through not knowing the way to preserve them, are soon destroyed by insects, and the collector's enthusiasm is dampened. It is then difficult to get him to start again.

It was felt by the Council of the Ottawa Field Naturalists' Club that very useful work would be accomplished by giving a demonstration of the best methods of collecting and preserving natural history specimens so that anyone who wished to begin a collection might do so in the right way. Accordingly, a special meeting of the Club was held on April 26th, 1904, and demonstrations were given by experts in various branches of science. Mr. A. G. Kingston described his methods of observing and identifying birds with a field glass. Dr. Jas. Fletcher spoke on the advantages of the study of Entomology. Dr. H. M. Ami discussed the collecting and preserving of geological specimens. Demonstrations were given of the mounting of plants by Miss Macoun ; of insects, by Mr. A. Gibson and Mr. W. Metcalfe ; inflating caterpillars, by Mr. C. H. Young ; preparing geological specimens, Mr. Geo. Burland.

In addition to the addresses and demonstrations already referred to, Prof. J. Macoun told how to collect, mount, and preserve botanical specimens, and, in order that as many as possible may get the information thus given by him, the most important

points with regard to collecting and preserving, are made the subject of this Nature Study article, and it is hoped that the other addresses which were given will be published also.

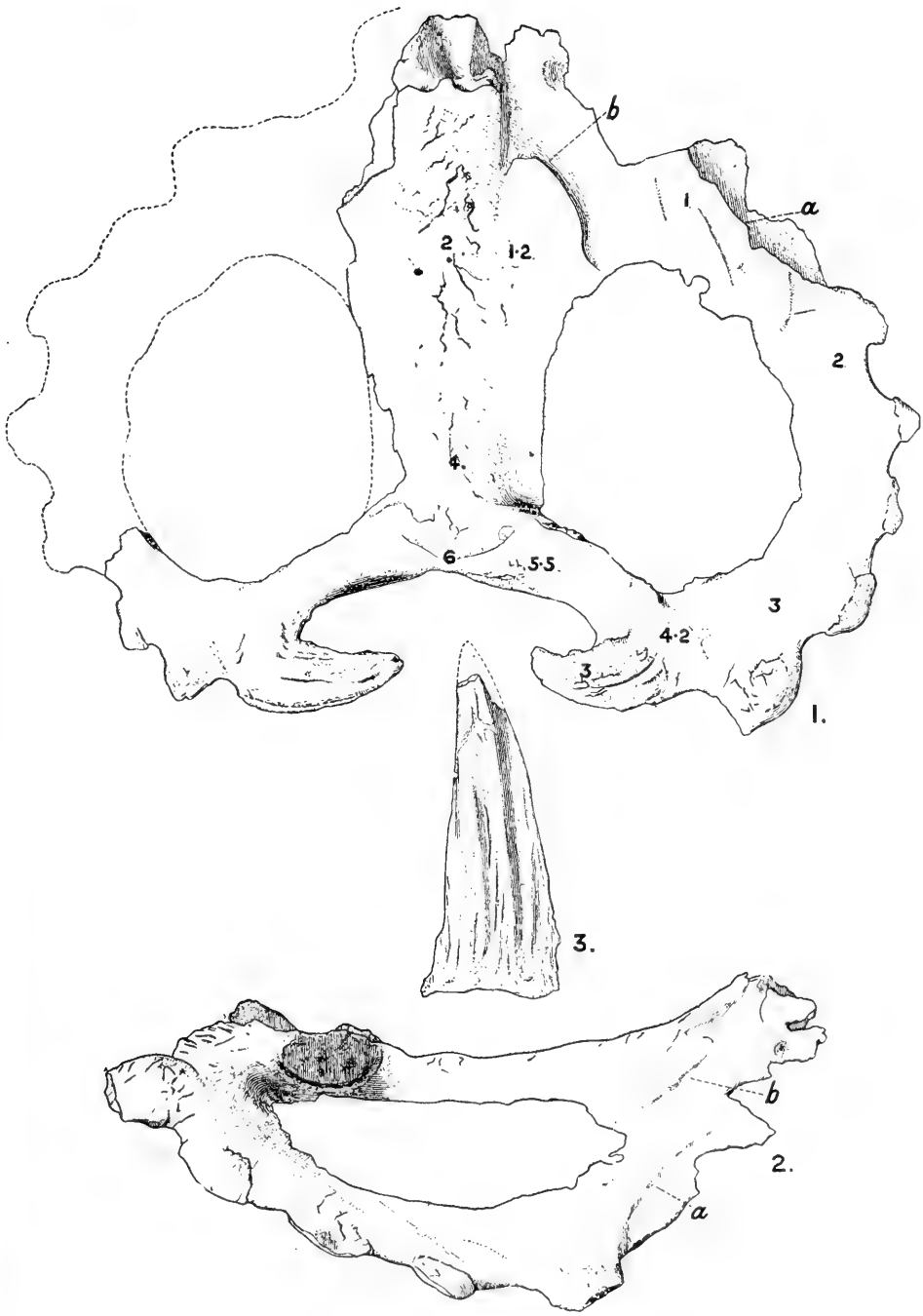
Prof. Macoun said that it was necessary, first of all, to have the desire to make a collection of plants before beginning the work. Unless the student had the desire, little benefit would be derived from it. A good herbarium was a proof that there had been a desire. In collecting plants, it is not very important what they are carried in while out in the field, providing they do not wilt before pressing. The lack of a tin case should not deter one from getting specimens, as a basket answers the purpose very well; but the best practice is to put the plants when collected into the plant press at once. A trowel or a strong knife are convenient for digging up the plants; but these again are not really indispensable, as strong fingers will dig up almost any specimen. A good plant press is a necessity, and it should be light and strong. A very strong press is made with two boards, each made of three pieces of wood nailed together. Each piece is very thin, but great strength is obtained by having the middle piece with the grain crosswise. Joined in this way the boards will stand all the pressure they will get without breaking. When taken to the field, the boards may be kept in place by means of a stout shawl strap, by which also sufficient pressure can be given. If possible, there should be two extra boards at home made of ordinary inch wood, between which the plants may be put the day after they are collected, aad pressed by means of a strong strap or some heavy weight. When one is going on a collecting trip, enough papers should be put in the press for all the specimens that are likely to be obtained; but, the lighter the press, the better. Newspapers cut to about the size of the press or a little smaller and of a single thickness of paper are very convenient for putting the plants on, and filter paper or blotting paper for covering the specimen and to absorb the moisture.

When one is making a collection, it is well to try and obtain a typical and perfect plant of the species, as, once an inferior specimen is dried and mounted, one is not likely to get a better one, and perfect specimens add very much to the attractiveness and value of a herbarium. It is sometimes puzzling to the beginner

to know what is a good specimen, as a sheet will apparently only take a plant of a certain size. If the plant is a small one, the whole of it should be taken, the roots being carefully separated from the soil so as to injure them as little as possible. If flowers and fruit can be obtained on the same specimen, so much the better; but usually it is necessary to collect a plant when it is in full flower, and then when the fruit is nearly or quite full grown. In order to get the whole of a large plant on a sheet, it may be bent either once or twice, in order to do it. It is much better to do this than to lose the roots or root leaves, the latter especially being sometimes necessary in identifying specimens. If the stem or root of a plant is thick, it may be cut down its centre, leaving one side intact. Specimens of trees and shrubs may be made of branches a little smaller than the sheet, the important point being to get the whole of the flower cluster, if possible, and one or more well developed leaves. When a plant is laid on the piece of newspaper in the press, the temptation is to spread the leaves out carefully to prevent their creasing. This is a great mistake and many a fine specimen has been spoiled in this way. Some plants will stand such treatment, but many will not. As a rule, the most satisfactory way to do, is to lay the plant on the newspaper, placing the leaves or flowers so that the specimen will look fairly symmetrical and then without trying to take out all the creases in the leaves, put on the filter paper or blotting paper and press the specimen with the hand or between the boards if there is only one plant to put in. The next day, when the plant has wilted, some of the creases can be readily smoothed out; but, after the plant is pressed, these are not noticed nearly as much as when fresh; and, indeed, they sometimes look better, as when the under side of the leaves show here and there, it makes a pleasing contrast, and it is important also at times to show the under side of the leaf as well as the upper side. Some of the more delicate ferns may be dried with advantage between two pieces of newspaper, the drier being put on top of the newspaper. This avoids disturbing the specimen when changing the driers, as the upper piece of newspaper need not be removed until the plant is dry. The specimen when once laid on the newspaper should not be removed from it until it is dry. When a plant is wilted and not dry, it is very difficult and

sometimes impossible to replace the specimen without injuring them. An exception may be made with very succulent plants or fleshy plants, when both upper and lower papers should be changed to get rid of the moisture as soon as possible, and sometimes it is necessary to dip the plant in boiling water in order to kill it. Some plants retain their colour fairly well, even if improperly dried, but the majority lose their original colour unless they are dried quickly and properly. Plants should be dried as rapidly as possible after the first day, and in order to do this the driers should be changed at least once a day and, if possible, twice at first. After the first day or two, when the excess of moisture has been removed, the hotter the driers are, the better the results will be, and, in order to have the driers quite hot, they should be heated on or at the stove and put on the specimens at once. If it is not convenient to heat the papers in this way, they may be dried outside and not especially heated. As some plants dry much quicker than others, the best results will be obtained if a thin piece of wood is kept between the plants which are in different stages of drying, as, if this is not done, a plant which would dry very quickly is kept moist by others of a more succulent nature. Some plants will dry in two or three days, and some take nearly two weeks. One can easily tell by the touch when they are dry.

Many a collection of plants has been ruined by insects after it has been made, and the enthusiasm of the collector may die with the loss of his specimens. The poisoning of plants after they have been dried should never be neglected, and the sooner it is done, the better. One of the best formulas for this purpose is : Corrosive Sublimate 1½ drachms ; carbolic acid, 1½ drachms ; alcohol, 12 ounces. A small brush is used to apply the poison which should be painted over all the plant that is exposed, the flowers especially getting a full share, as the insects will frequently destroy the flowers when they will not injure another part. Alcohol is used instead of water, as it evaporates without leaving a stain on the paper.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NOTES CONCERNING NEW BRUNSWICK WARBLERS.

By WM. H. MOORE, Scotch Lake, N.B.

BLACK AND WHITE WARBLER, *Mniotilta varia.*

Common during migrations, and quite a number breed, at which time they are partial to moist woodlands having thick underbrush. The spring migrants arrive during the first half of May. In 1898 the first arrivals were noted May 13th. In 1902, May 9, the first were heard singing their soft unattractive song, which is merely a few notes sounding we-see-we-see-we-see, uttered four or five times. The birds seem too busy searching about the bases of trees and stumps to pay any particular attention to a song.

Although I have never found a nest of this species, the young have been observed when apparently away from the nest only a day or two. They were five in number and were being fed by both parents. They were in a young scrubby second growth of conifers along a steep bank of a brook. They migrate southward in September, but at that period the plumage is not so plainly streaked as in springtime.

GOLDEN-WINGED WARBLERS, *Helminthophila chrysoptera.*

In June 1903 a bird of this species was observed in the vicinity of Fredericton.

NASHVILLE WARBLERS, *Helminthophila ruficapilla.*

The species arrives from the south about the same as *M.varia*, during which period they are tolerably common. It is a pretty common summer resident in the central part of the province, but rare in the countries bordering the Bay of Fundy. It breeds about partially cleared tracts. One nest

found July 15th was placed in the side of a small mound, and was well concealed by mosses and overhanging ferns. The nest was composed of grasses and moss and lined with fruit stems of hair moss. The female flushed from the nest and disappeared among the numerous, small evergreen bushes that grew near the nest, nor did she put in an appearance during the half hour I stayed near. The nest measured, outside diameter 3 inches, inside 1.75, outside depth 2 inches, inside 1 inch, and contained three eggs, white, marked with rufous and cinnamon-brown, chiefly about the larger end.

TENNESSEE WARBLER, *Helminthophila paregrina.*

Have observed this rather rare species but have never become acquainted with its habits. It arrives late in May or early June.

PARULA WARBLER, *Comsopthlypis americana.*

A fairly common migrant and summer resident, arriving here the first half May. Its shivering skew-ee-oo song is most often emitted from a high perch in tall trees. The writer has found two nests of this species, one of which was situated forty feet up in a yellow birch tree, the other was twenty feet up in a beech. Both nests were made in *Usnea* lichen where it hung below the limb on which it grew. The lichen had been shaped at a distance of four to six inches below the limbs, and sewn with horse hairs to keep in shape for a nest. The cavity of the nest in the beech measured an inch and one half in both depth and diameter, and contained four eggs, white with rufous markings about the larger end.

The last bird observed during 1902 was on September 17th.

CAPE MAY WARBLER, *Dendroica tigrina.*

As a rule this species is a rare summer resident. But during the summer of 1902 it was tolerably common. The first spring migrant recorded that season was on May 17th. It frequents young evergreen thickets, and in such places one may hear their seep. seep, seep, seep, of a song and the bird be entirely hidden from view.

YELLOW WARBLER, *Dendroica æstiva.*

After May 20 this species is a common summer resident along the river valleys, where it breeds in the shrubbery and is especially

partial to roadside tangles of willows, alders, and rosebushes. The nests are compact structures built of plant fibres and grasses, somewhat felted together with down from the fruits of the willows and poplar trees. Several nests observed were within three feet of the wheel tracks of highways. Nests of average size measure 1.75 inches in depth and diameter, inside, 3 inches in outside diameter. From three to five eggs complete a set. Both birds engage in incubating, which period lasts from ten to twelve days. This species of warbler I have never observed on the highlands back from the river valleys. They depart southward in September.

BLACK-THROATED BLUE WARBLER, *Dendroica cærulescens.*

About the middle of the month of May, if we happen to be in the vicinity of mixed-growth woodland, we will be likely to hear a song of zye-zye-zye, and will know that the black-throated blue warbler has arrived for its summer sojourn with us, during which season it is tolerably common. A nest of this species found July 21 was built of bark and fibres, in a small beech bush two feet up. The cavity of this nest measured 1.50 inches in depth and diameter and contained three eggs, white with obscure olive-brown markings about the larger end. As the writer passed this nest, the female flushed from it, and apparently with several wings and legs injured and dragging she fluttered about endeavouring to allure her disturber from the nest. The male kept quietly at a distance of about ten yards.

These birds are quite expert fly-catchers and may often be seen tumbling through the tree tops in pursuit of insects.

MYRTLE WARBLER, *Dendroica coronata.*

This species is the first of the warblers to arrive during spring migration, at which time it is not uncommon. During the autumn migration it is very common, and a few breed in central New Brunswick. Ordinarily they are with us from April 20th until September 25th. They are expert fly-catchers, and keep more to the fields in which bushes grow, than do any of our other warblers. One nest found was placed six feet up in a tamarack bush and contained four eggs. The birds are very much concerned when one is in the vicinity of their nest.

MAGNOLIA WARBLER, *Dendroica maculosa.*

Common summer resident, arriving after the middle of May. During the mating season the males are pugnacious little fellows, and many fights do rivals have. They attack each other with much fierceness, seizing hold with their beaks, and hitting with half-opened wings they sprawl about on the ground, until thouroughly overcome.

When pressing his suit to the female of his choice, the male displays his colors to great advantage, as they show in fine contrast among the bright green foliage of the trees. During the nesting season they frequent bush-grown pastures and such places. The nests are rather roughly constructed of grass stems, and lined with hair and grass blades. The cavity measures in depth and diameter 1.50 inches. During the early part of June 1903, a pair built a nest in two days, most of the material being taken from a deserted nest of *Spizella socialis.* The eggs which are from three to five in a set are white, marked with olive-brown and cinnamon. Both parents engage in incubation, the time required being twelve days. The parents are rather shy when one is in the vicinity of the nest, and will often slip quietly from the nest, as the observer approaches, but in the protection of the young they display more courage, and concern. The song which sounds like chee-chee-chee-chee-oo although not amounting to much in quality makes up the deficiency in quantity, and is sung by the male from the time of arriving in May until the young are nearly fledged in June.

CHESTNUT-SIDED WARBLER, *Dendroica pensylvanica.*

In this section one of the late arriving warblers, not being observed until late in May. In 1898 the first noted was May 19th. This species is a rather rare summer resident, and is found mostly about the scrubby edges of woodlands in rather moist places. The male has a beautiful song much like that of the yellow warbler. He also displays great anxiety if one approaches the near vicinity of the nest.

BAY-BREASTED WARBLER, *Dendroica castanea.*

Ordinarily this species is very rare here but during the summer of 1903, it was with us in goodly numbers, and several pairs were known to breed in the vicinity of Fredericton. The

nests were composed of small twigs, bark, etc., and lined with hairs and other fine material. Of two nests that came under the notice of the writer, one was built in a small cedar, about five feet up, and contained five eggs. The other was built in a spruce, thirty feet up, and twelve feet out on a limb, overhanging a brook, and contained six eggs, which were whitish with dark spots; the ground color had a pale bluish-green tinge. The parent birds showed little anxiety while observers were near the nest, in fact one male continued his singing in nearby tree tops. The female of this pair had very little of the bay colour showing in her plumage.

BLACK-POLL WARBLER, *Dendroica striata.*

A rare species here; has been observed at St. John and near Fredericton during the spring migration.

BLACKBURNIAN WARBLER, *Dendroica blackburniæ.*

This beautiful bird is a tolerably common summer resident, and is a bird of the woods, seeming to be partial to tracts where hemlocks grow. On one occasion the writer observed a female feeding young which were able to fly well, the time of year being June 27th. The song of the male sounds like the syllables wesee-wesee-tse-tse-tse. But the song varies with different individuals.

BLACK-THROATED GREEN WARBLER, *Dendroica virens.*

This is a fairly common warbler of the woods from the first day of May until September. The male is a very ambitious singer, and from its arrival until July 15 it occupies much time by pouring forth its attractive song which, anglicized, sounds like zye-zee-zye-zee-zee. Although this bird is fairly common, I have learned but little of its nesting habits while with us.

YELLOW PALM WARBLER, *Dendroica palmarum hypochrysea.*

This species is a spring migrant at Fredericton and near St. John.

OVENBIRD, *Seiurus aurocapillus.*

A common bird of the woodland, where one may know of its presence by hearing the melodious, attractive, and seemingly ventriloquous song of the male which rings through woods and groves sounding like p-chup p-chup p-chup p-chup often extended to eight

or ten syllables. These birds feed largely on the ground where they walk about, instead of hopping as do most other small birds.

The nest of this species is built upon the ground, sometimes partially concealed by a bush or other plants, but sometimes without any attempt at concealment, and is composed of leaves and fibres compactly woven and the cavity covered over, so that the entrance is at the side. The eggs number from three to five, and are white, speckled with cinnamon or rufous-brown. The female is a very close sitter and will almost allow one to step upon the nest before she will betray its presence by taking flight. When disturbed she flutters from the nest in an apparently helpless condition, trying to allure her enemies from her home. The sexes are the same in color of plumage. They may easily be mistaken for thrushes which they much resemble, but are somewhat smaller, than those birds are when adult.

WATER THRUSH, *Seiurus noveboracensis.*

A common bird of swamps and water courses. With us from mid-May until October. We first know of its arrival in spring by hearing the male pouring forth his loud, sweet, liquid song, from some high perch in a tree along a brook. He sings most enthusiasticaly while his mate is searching about on the ground, gleaning some choice material with which to build a nest. His loud song without a doubt calls the attention of enemies to himself, and leaves his mate with less watching for her own safety at that season. During autumn migrations they often stroll about buildings in search of flies or other insects, that may be partially concealed in crevices.

MOURNING YELLOW, *Geothlypis philadelphia.*

This species has been observed in Westmoreland county by Mr. J. Brittain.

MARYLAND YELLOW-THROAT, *Geothlypis trichas.*

A not uncommon summer resident from the middle of May until September. They prefer thickets along water-ways and damp places, and from such places the male sends fort his wichity, wichity, wichity, sounding song. This species gets quite excited, at any disturbance in its near neighbourhood, and generally seeks to solve the cause of disquiet with much chipping and purring about through the intervening shrubbery.

WILSON'S WARBLER, *Sylvania pusilla.*

Has been taken at Petitcodiac and observed at Fredericton.

CANADIAN WARBLER, *Sylvania canadensis.*

A tolerably common summer resident from May until September. Generally found in low, wet woodland that has considerable undergrowth; it is also found along river margins. This species has a sweet, liquid song, we would write it chip-it-che chip-it-che chip-it chitt-it-it They display great anxiety if one intrudes too closely upon their nesting site, and give vent to their feelings by rep atedly uttering a smart sounding chip. Yet they can overcome their emotions sufficiently to make short sallies after passing insects which they easily catch.

AMERICAN REDSTART, *Setophaga ruticilla.*

A tolerably common summer resident of orchards and moist woodlands near clearings, staying with us from May until September. The habits of this pretty species are very much like those of some of the flycatchers, both in manner of taking its food, and nest building. They are expert fly catchers, as one may know by watching them for even a short time, as they float, dart and whirl through the foliage of the trees, occasionally resting with drooping wings and half spread tail, to sing their chee-chee-chee, ser-wee, swee-e-e. The song of the immature male during his second summer is very different from the song of the adult male. At that age the young male still more closely resembles the female in appearance, than he does with the black and dark orange colors of the plumage of the older males.

The nest of this species is built, like the nest of the least flycatcher, of grasses, fibres, plant down, and threads, if obtainable, placed in a fork of a bush either close against the trunk or out on a limb. The eggs are from three to five in number, grayish white or bluish white, with cinnamon or brownish spots about the larger end. The parents are very vigilant in guarding their eggs and young. On one occasion when I was driving along a highway, a male redstart fluttered out from the vicinity of its nest, and fluttered along beside the horse endeavouring to allure us from the place. His plumage of rich orange and black showed to good effect against a background of rich green grasses and shrubs.

MEETINGS OF ENTOMOLOGICAL BRANCH.

Meeting No. 14 held at Mr. MacLaughlin's, on February 24th, 1904; five present. Mr. Harrington exhibited Ottawa coleoptera belonging to the families Ptinidæ, Lampyridæ, Malachidæ and Cleridæ. Many species of the Ptinidæ are injurious to various trees, boring especially in injured specimens; other forms destroy certain kinds of hardwood timber, also various drugs and dry vegetable substances, etc. The Lampyridæ are chiefly carnivorous in the larval stage, feeding frequently upon snails; the beetles are rather soft and unattractive in appearance, except those forms known as fire flies, which attract attention during their nocturnal flights by the bright flashes which they omit from certain segments of the abdomen. The Cleridæ are prettily marked beetles, which are predaceous in both the larval and the perfect states. Mr. Metcalfe said that he had observed *Clerus 4-guttatus* and *Thanasimus dubius* feeding upon a large plant-louse infesting pines. Mr. Harrington also showed a large handsome fly, which he identified as *Alophora magnapennis*, recently described in Psyche by Mr. Johnston from a specimen collected by Mr. Chagnon, of Montreal. Mr. Harrington's specimen was collected in 1902 in the Beaver Meadow, Hull. Mr. Gibson exhibited the following moths, which had been taken or bred for the first time in Ottawa—*Papaipema harrisii*, *Semiophora opacifrons*, *S. climata*, *Hillia crassis* and *Homoglæa hircina*. He also exhibited, on behalf of Dr. Fletcher, a fine pair of the large and rare beetle *Dynastes grantii* from Phœnix, Ariz., and read an interesting note on these so-called Goliath beetles.

Meeting No. 15, held at Mr. Baldwin's, March 10th, 1904; six present. Dr. Fletcher showed an advance copy of the Annual Report for 1903 of the Entomological Society of Ontario, which seems fully up to the high standard of these publications. It contains a capital portrait of the Rev. G. W. Taylor, formerly one of the Leaders of our Club, and now doing excellent work in Vancouver Island, especially in the geometridæ. Among the papers in the Report are one by Dr. Fletcher on the Insects injurious to Ontario crops in 1903, and one by Mr. Gibson on Basswood

Insects. Mr. Metcalfe read a list of Brockville *homoptera*, mostly determined by Mr Van Duzee and containing many good species ; the total number being 56, in 27 genera. Mr. Baldwin exhibited a fine example of the California Trapdoor Spider, *Cteniza californica*, and its subterranean nest. Mr. Harrington showed a box of European coleoptera and colored drawings of over 100 species of Ottawa beetles. Mr. Gibson exhibited 13 species of moths of which the larvæ bore in the stems of plants, and also inflated larvæ of several species. He explained that much work had been done on these forms of late, especially by Mr. Bird, who had reared many of the species. Mr. Lyman of Montreal, and others, were also now studying them and developing their life histories. *Papaipema cerussata*, the larva of which was first discovered by Mr. Lyman as a borer in *Thalictrum*, was common at Meach Lake in the common dock (*Rumex occidentalis*), and *P. cataphracta* infests burdock, lilies, potatoes, etc. The following species were shown :—*P. cerussata*, *P. impecuniosa*, *P. duovata*, *P. rutila*, *P. marginidens*, *P. cataphracta*, *Gortyna immanis*, *G. stramentosa*, *G. obliqua*, *G. velata*, *Achatodes zeæ*, *Macronoctua onusta* and *Sphida obliqua*.

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Meeting No. 16, held at Mr. Harrington's, March 24th, 1904; four present. Mr. Gibson exhibited an interesting photograph taken by Mr. Lyman of a gathering of entomologists in the arboretum of the Experimental Farm, on the occasion of the meeting in Ottawa of the Entomological Society of Ontario last autumn. He also showed larvæ of the small mosquito *Aedes smithii*, Coq., from the Newington Bog. Similar larvæ had been taken at the Mer Bleue in pitcher plants. Dr. Fletcher exhibited a box of hymenoptera from Mr. Cockle, of Kaslo, B.C., and apple twigs infested by San Jose Scale, or with infestations which had been mistaken by correspondents for the San Jose Scale ; such as the Oyster-shell Scale ; a fungus remarkably similar in appearance to the genuine scale ; and such a dissimilar infestation as a twig covered by the scars made by the Buffalo Leaf-hopper in ovipositing. He showed also axe-handles destroyed by the Powder-post Beetle, *Lyctus striatus*, with specimens of the larvæ, pupæ and

beetles. Mr. Harrington exhibited beetles belonging to the Lucanidæ, Scarabæidæ and Cerambycidæ.

Meeting No. 17, held at Dr. Fletcher's, April 14th, 1904 ; ten present. Dr. Fletcher suggested that a portion of the time be devoted to considering the work to be done during the season then commencing, and made some useful suggestions as to the labelling, etc., of specimens, so as to make them really of value in subsequent studies. Mr. Gibson read a paper on *Abbotana clemataria*, the Clematis Looper, in rearing which different food plants had been tried ; elm leaves having been preferred. Dr. Fletcher exhibited samples of boxes, labels, electric pocket-lantern, etc., Lord Walsingham's beautifully illustrated "Pterophoridæ or Plume Moths," and Bulletins of the Agricultural College of Tokio, Japan, with fine plates of silk-moths, etc. Mr. Metcalfe exhibited some rare homoptera and Mr. Harrington some Ottawa coleoptera and some hymenoptera from France.

Meeting No. 18, held at Mr. Gibson's, on May 4th ; five present.

Mr. Metcalfe showed 17 species of Hemiptera taken at Ottawa early the present season. He also showed a collection of Hemiptera, Diptera and Coleoptera collected at Brockville in the summer of 1903.

Mr. Baldwin showed some common larvæ which he had gathered, viz., *Noctua c-nigrum*, *Mamestra lorea* and *Ctenucha virginica*

Dr. Fletcher gave an interesting account of the habits of *Erebia vidleri*, and showed some young larvæ which had recently hatched. This rare butterfly, as far as is known, only flies on the summits of Mount Cheam in British Columbia. Dr. Fletcher also spoke of the moths of the genus Xylina and showed examples of those species which occur at Ottawa. A new species which has just been named *Xylina fletcheri* was of special interest.

Mr. Gibson showed a number of living caterpillars which he had collected and spoke of certain traps which he used in order to get specimens for breeding. The breeding of insects is a fascinating part of the study and one in which there is a wide field for original research.

THE FERTILIZATION OF CALOPOGON PULCHELLUS.

By A. B. KLUGH, Secretary, Wellington Field Naturalists' Club, Guelph, Ont.

This beautiful orchid is an inhabitant of open bogs, and where it finds a deep bed of Sphagnum with plenty of water beneath, flourishes in great profusion. The outstanding characteristic of this species, which easily distinguishes it from any other of our *Orchidaceæ*, is the position of the labellum, which, on account of there being no twist in the ovary, is uppermost. This peculiarity is noted by Gray, but in Britton and Brown not only is no reference made to it in the text, but the diagram is incorrect, as it shows the column uppermost. The representation of the labellum, which is given separately, is also erroneous as the triangular dilation at the base is omitted, as are also the bracket-like ridges.

On account of the unique position of the labellum and the very open character of the flower, I thought that the method of fertilization would prove interesting and determined to investigate it. The way in which it is accomplished is as follows :—The bee alights upon the labellum, which bends near the base (the three bracket-like ridges prevent it doing so elsewhere) until the back of the bee is in contact with the column. The bee, which is of course up-side-down, sups the nectar secreted by the glands at the base of the column. As it withdraws, its back opens the operculum of the anther, and a pollinium (or several) adhers to its back. On visiting the next flower the pollinium slips past the convex surface of the closed operculum, but as the bee withdraws, the pollinium is caught by the slight beak of the stigma and adheres to it, the bee meanwhile receiving another pollinium from the anther of this flower.

THE BROWN PELICAN ON CAPE BRETON ISLAND.

In a letter dated July 5th, 1904, Mr. Harry Piers writes :— A short time ago I secured for the Provincial Museum at Halifax, N. S., a Brown Pelican (*Pelecanus fuscus*) shot at Louisburg, Cape Breton, on May 19th, 1904. The taxidermist says that it is a male.

Like the Man o'War bird and the Yellow-billed Tropic bird, the Brown Pelican is a southern and purely marine species, which occasionally strays as far north as the maritime provinces of Canada. But, in Canada, so far, the Brown Pelican has been found only in Nova Scotia.

J. F. WHITEAVES.

"Hints on Making Nature Collections in Public and High Schools" is the title of a bulletin recently issued from the Ontario Agricultural College and Experimental Farm. Its author is Dr. W. H. Muldrew, the Dean of the Macdonald Institute. The bulletin is intended as a guide to teachers and pupils in the making of collections of natural history specimens and with the help of admirable illustrations Dr. Muldrew has succeeded in compressing into a small compass very clear and easily understood directions for the preparation and preservation of natural history specimens and young students in botany and entomology especially will find this bulletin of great service to them. School gardens also receive attention and in describing the methods of making a collection of living objects Dr. Muldrew has been careful to choose objects which are easily procured and which may be cared for with little trouble. By following his directions any one may maintain a small aquarium at insignificant cost.

A very important section of the bulletin is that which deals with the making of historical collections. This is a matter which has been sadly neglected in Canada and there is no district which will not contribute something of historic value if properly studied. If nothing more than a few arrow-heads or an old musket, these are well worth preserving if reliable data regarding them can be procured.

NATURE STUDY—No. XVI.

HOW TO MOUNT PLANTS AND COMPLETE THE HERBARIUM—PRACTICAL RESULTS FROM THE STUDY OF PLANTS.

W. T. MACOUN, Horticulturist, Central Experimental Farm, Ottawa, Ont.

In the July number of THE NATURALIST (Nature Study—No. XV) an attempt was made to describe the best methods of collecting and preserving plants. In the following pages the way to mount plants is described, as, even if the specimens are well preserved, they will be difficult to handle unless they are properly mounted on convenient sheets. A few suggestions are also given for the completion of the herbarium, and reference is made to the practical results which may be obtained from the study of plants.

There is considerable art in the mounting of plants, and much individual taste may be shown. Plants should not, however, be mounted with the main purpose of making them look attractive on the paper. Where possible, flower, fruit and root should be shown on the one sheet of paper, but never more than one species; and, if the flower only is obtained the first year, space should, if possible, be left for the fruiting plant. Another important point to be taken into consideration, is the way the plants will lie when piled together. If the roots are always put at the bottom of the sheets, the pile will not be level, but by placing the specimens now on one side and then on the other, or by mounting the specimens in various places on the sheet and, when the plant is large, having the roots sometimes come at the top of the sheet, the pile may be kept level, which will make the collection much easier to handle. The standard size of mounting paper is 11½x16½ inches; but a more economical use of paper may be made by having it 11x16 inches, as, at this size, one large sheet of paper will just make four sheets of mounting paper. There are many grades of white paper, and, if the collector can afford it, it is wise to get it good, the kind known as Bristol-board being very satisfactory. Good mounting paper may be obtained from Mr. F. W. Hodson, Dominion Live Stock Commissioner, Ottawa, at 50 cents per hundred sheets. With experience, plants can be mounted quickly and neatly; but, when beginning this work, the greatest care should be taken, as

otherwise one is liable to daub the paper with glue or not get the specimens firmly fastened. Chase's and Le Page's liquid glue are very satisfactory for mounting, but both of these preparations should be diluted with vinegar before using. To mount most plants, place the specimen on blotting paper, under side up, then hold the specimen with one hand, and with the other glue the stem, leaves and flowers or fruit; then, pick the specimen up, turn it over and place it on the mounting sheet in the position it is to go; now take three or four newspapers, and with them press the specimen down with a gliding movement of the hand. If one is expert and can mount rapidly, three or four specimens may be mounted and then placed under a light weight, it being very important to have the weight as large or larger than the sheet, so that the specimen will be pressed evenly; but, if one is only beginning to mount, it is wise to put each specimen as mounted under the weight. A large book placed on a sheet of heavy paste-board makes a very good weight. Plants which are not easy to handle, such as delicate ferns, may be laid on a clean sheet of blotting paper under side up and the glue applied as before; but, instead of lifting the specimen, take the mounting paper and lay it on top of the specimen and then press it. In order to make specimens with large stems more secure, strips of thin gummed paper about one eight of an inch in width are used to hold the plant. This paper may either be bought prepared or be gummed by covering it with mucilage, which is let dry and the paper then cut into strips as needed. The gummed paper is usually made as wide as the mounting sheet, as some collectors hold down the grasses and carices with long strips of gummed paper, rather than attempting to glue them. Many collectors, however, use only small strips of gummed paper only an inch or an inch and a half in length.

Each mounted sheet should be neatly labelled with a white paper label about 2x4 inches, and on it should be written the name of the species, the date of the collecting, the collector's name, the habitat and place where the plant was found growing, and the date. The label is glued to the sheet at the lower right hand corner, but only attached lightly at the outer end so that it can be readily removed if necessary. If labels are not used, the required data should be neatly written on the sheet. When

collecting each specimen, it is important to write the name of the plant, if known, the place where it was collected and the date, on a piece of paper which is kept with the specimen until the regular label is written. It is not a good practice to trust to the memory, as after a season's collecting one cannot remember all the particulars. Plants of each genus are kept together in what is known as a genus cover, which is a folded sheet of strong paper, a little larger than the mounting sheets (12x16½ inches); and, for the outside of the genus covers, genus labels may be obtained on which is written the name of the order and genus to which the plants belong. The label is attached to the lower left hand corner.

The genera should be arranged in botanical sequence in a cabinet, which should be kept closed to prevent injury from dust and insects.

No herbarium is complete without a list of the specimens contained in it, and a check list of Canadian plants or of the plants of Ontario will be found of great use in marking the species which have been collecting and at a glance seeing those which are still to be procured. A check list of Canadian plants has been published by Mr. James M. Macoun, Ottawa, and of the plants of Ontario, by Mr. W. Scott, Normal School, Toronto.

PRACTICAL RESULTS FROM THE STUDY OF PLANTS.

It may be asked, what practical benefit can be derived from the study of plants? This is a very pertinent question; for, in this age of keen competition it is as well, if possible to obtain something that will be of use to us in life, even from what may appear at first sight merely a delightful pastime. When Prof. John Macoun explored Manitoba and the North West Territories in the seventies and travelled for hundreds of miles without seeing a white man nor a cultivated field, he was as certain that this great territory would eventually produce millions of bushels of wheat as it is now certain that they have been produced, and, when he was laughed at for his enthusiasm, he said "You will see that I am right." Why was he so certain? Because of his knowledge of plants. He knew what wild species of plants grew in sandy soil, loamy soil, clay soil and gravelly soil ; what kind would not thrive where the soil was alkaline and which kinds would. H

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was also able to tell whether the soil was wet or dry by the plants which grew upon it. He also knew what plants required a certain amount of heat to mature seeds. Thus he was able to draw his conclusions as to what proportion of the country would produce wheat and what would not. If a plant were found which took as long as wheat to mature, required as good soil to grow in, and as great heat to make it develop, it was quite safe to conclude that the soil and climate were suitable for wheat. This same knowledge of plants has been used more recently by Mr. Jas. M. Macoun in exploring the Peace River District. How great a service it would be to the farmer if he were familiar with the habits of plants and knew more of the commoner species! The knowledge would be of the greatest value to him in the purchase of land; for he would be able to tell at a glance whether a soil was poor or not, or whether it needed drainage. A knowledge of the root growth of weeds would make the eradication of them much easier for him; for he would better understand what system of culture was necessary. Few farmers know that every kind of weed has a seed which is quite distinct from every other kind. If he knew at sight the seeds of the worst weeds, it would be of the greatest possible service to him in helping him to keep his farm clear of them. While those practical applications of the study of plants are especially valuable to the farmer, they are useful to the market gardener and townsman as well; but there are other ways in which the latter may gain knowledge which will be useful to him. There are many species of fungi which are very useful as food; but the intense ignorance which prevails, makes them of comparatively little value except to a few. The study of fungi would soon lead to a knowledge of the edible kinds and to a larger consumption of this nutritious and wholesome food. To the amateur gardener the study of plants and their habits affords an inexhaustible field. He learns the time of blooming of the different species and varieties, the kinds which require wet soil and those that do not, the height to which each one grows; and he gets an endless amount of knowledge of plants which is of the greatest value to him in his gardening operations. There are many other practical applications which might be mentioned; but there is not room for them here and, in addition to all this, there remains the great fact that the more knowledge we have, the better is life worth living, and the knowledge which can be obtained in such a delightful manner as by studying plants and their habits, is sure to have no other than beneficial results.

A list of the books which are most useful in the study of plants, will be found in THE OTTAWA NATURALIST for May, 1904.

THE OTTAWA NATURALIST.

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DESCRIPTION OF A NEW GENUS AND SPECIES OF RUGOSE CORALS FROM THE SILURIAN ROCKS OF MANITOBA.

By J. F. WHITEAVES.

APHYLLOSTYLUS, gen. nov.

Corallum consisting of slender, contiguous, subcylindrical corallites, that are circular or nearly circular in transverse section, and that seem to have formed part of a compound, branched, fasciculate, ascending and somewhat spreading colony, essentially as in *Pycnostylus*. Surface markings of the exterior of the corallites unknown.

The structure of the interior of the corallites consists of conspicuous transverse tabulæ, and of numerous, very minute, spiniform septa. The tabulæ, though irregular in their disposition and in their distances apart, are for the most part complete and continuous. The spiniform septa consist of both longitudinal and transverse rows of close-set, very short, straight and inwardly directed, minute spinules, not very unlike those of a Silurian Favosite, but much smaller and shorter. Where the tabulæ are comparatively far apart, the longitudinal arrangement of the rows of spinules is very obvious, and there are from four to seven spinules in each longitudinal row, between two of the tabulæ. But, in places where the tabulæ are close together, the transverse arrangement of the rows of spinules is more apparent, and there are either one or two transverse rows of spinules between two tabulæ.

The general shape of the corallites in this genus, their mode of growth and their internal tabulæ, appear to be essentially similar to those of *Pycnostylus*, but in the latter the septa are marginal, well developed, and consist of thin, continuous, longitudinal ridges.

Pycnostylus seems to be most nearly related to *Amplexus*, which is usually referred to the Zaphrentidæ, and it may be that *Aphyllostylus* should also be included in that family.

ÀPHYLLOSTYLUS GRACILIS, sp. nov.

Corallites slender, averaging about two or three millimetres in diameter; septal spinules very minute, scarcely visible to the naked eye.

This genus and species are based upon fragments of colonies, n six small pieces of limestone of Silurian (Upper Silurian) age, rom Stonewall, about thirty-one miles west of East Selkirk, collected by Mr. J. B. Tyrrell in 1897. Each of these pieces of limestone shows both longitudinal and transverse sections of a few contiguous corallites, upon one or more of its recently broken surfaces. The internal structure of most of these corallites is well preserved, but their mode of branching is nowhere very clearly seen. Two or three similar specimens had previously been collected by the writer in 1888 from loose masses of limetone on the banks of the Fairford River, about six or seven miles below the Hudson Bay post at Fairford, Manitoba.

Ottawa, August 4th, 1904.

THE FLORA OF THE PEACE RIVER REGION.

By JAMES M. MACOUN.

There is perhaps no part of Canada in which a greater diversity of plants is to be found than in the Peace River region. Though the number of species is surprisingly small, yet plants characteristic of an arid climate may be found within a few miles of those requiring wet, almost boreal, conditions and a wonderful display of gorgeous prairie flowers may be seen within a few yards of the typical flora of the sub-arctic forest.

For the purposes of this short paper the words "Peace River Region" will refer only to the district drained by about one hundred miles of the Peace River, that is, the country north and south of that river between Peace River Landing and a point about forty miles above Dunvegan. In other words the region bounded on the south and north by Lat 55° and Lat. 57°, and on the east and west by Long. 117° and Long. 119°. This includes the whole of the area usually meant when the "Peace River Region" is spoken of. Westward from this district the country rises gradually to the Rocky Mountains, the Peace River taking its rise far to the northwest in British Columbia. From Peace River Landing the river flows northeasterly to Lake Athabasca, passing through what is known as the "Vermilion country."

The Peace River flows through the district under discussion in a deep valley, the bottom of which is from 700 to 1,000 feet, or even more below the plateau. The valley itself averages about three miles in width from rim to rim, the river flowing in sweeping bends from one side of the valley to the other cutting into the straight bank on one side while on the other a broad alluvial flat is formed, as is usual with all western rivers. The north bank of the valley is naturally warmer and drier than the south, as the full force of the sun strikes it, and this fact and the presence of a well-travelled trail on the north side accounts for the great difference between the two sides of the river. Repeated fires have almost wholly removed the forest, and the country between Peace River Landing and Dunvegan is almost all prairie, about 400,000 acres in all, while the south side is still clothed with forest. The extent of agricultural land in the valley is not great as the plateau is

reached by a series of slopes and "benches," the level land at the bottom never reaching a mile in width and seldom half a mile. It is on these slopes with a southern aspect that plants characteristic of an arid climate are found, chief among them a cactus, (*Opuntia Missouriensis?*) which is quite common. The grasses are those of the driest parts of the southern prairie region,

The prairie on the plateau above would delight the eye of those who admire large masses of one color, for abundant as individual flowers are the number of species is strangely small. Hundreds of acres will be seen on which a single species predominates to such a degree that it colors the whole landscape. To the writer this seems conclusive proof of two things, the first being the comparatively recent origin of these prairies, and the second, that only a small number of the prairie plants of the south can withstand the climate of the Peace River region. The most natural explanation of the occurrence of these prairie species there is that many of the seeds were brought from the south, attached to the buffalo which formerly were very abundant, and the forest having been destroyed by repeated fires the conditions were more suitable to prairie species than those of the forest. Those which first made themselves at home soon spread and occupied large areas, making it more difficult from year to year for new species to establish themselves. On the other hand, the seeds of many species must have been been brought there, which if they germinated at all, were unsuited to the climate and soon disappeared. But whatever hypothesis be adopted to account for the prairie in the first place, or the introduction of suitable plants later on, the paucity of species is very evident. *Castilleia miniata* is perhaps the most conspicuous and the most abundant, and not being relished by cattle seriously interferes with the cutting of hay on the open prairie. Several species of leguminous plants are also common, the best of these for forage purposes being *Lathyrus ochroleucus*, *Vicia Americana* and *Hedysarum boreale*. The latter is among the most beautiful plants growing on the prairie, and to see masses covering many acres is a sight not soon forgotten by anyone. Though not usually a conspicuous plant, *Astragalus hypoglottis*, is on the Peace River prairies one of the most valuable forage plants, and it is not uncommon to see the ground covered with this species

for hundreds of yards in every direction. No species rare in Canada were seen on the prairie, or indeed anywhere with the exception of *Caltha natans*, which abundant enough in that region in brooks and natural ditches, is very restricted in its range. The same might be said of *Adoxa Moschatellina*, usually found among moss around the roots of trees.

The flora of the woodlands is that of the sub-arctic forest though even here the number of species is not very large. Impinging as it does on the prairie the border of the poplar and spruce woods, shows a very curious mixture of prairie and forest species more noticeable here than further south, where the boundaries of the prairie are constantly changing, and in the poplar bluffs prairie species are often common. In the Peace River region, however, the prairie often ends suddenly at the edge of the virgin forest into which the characteristic prairie plants do not penetrate, while the plants of the forest of course, do not thrive on the open prairie, so that one may walk a few yards from the prairie to the forest or *vice versa* and find floras in which there is not a species common to both. It gives one a strange feeling to leave the bright prairie covered with masses of the most brilliantly colored flowers, and after walking for five minutes through the forest, to find oneself on the borders of a bleak moor, on which the vegetation is scanty, and willows and dwarf birches the only shrubs. In such places one may collect *Astragalus alpinus*, *Pedicularis Groenlandica* and *P. euphrasioides*, *Parnassia parviflora* and other species characteristic of cold, wet, poor soil. It is hard to believe when among such plants that a few hundred yards away the prairie is blazing with bloom, and only a mile or two further the bluffs along the river are covered with cactus.

As regards the rarity of the plants and the number of species the Peace River region is not an interesting one, but it affords a splendid field for the study of many interesting points in connection with the distribution of plants. The most important lesson taught is that whatever the climatic conditions or the character of the soil Nature may be depended upon to cover up the earth with verdure of some kind, if the forest is permanently removed plants peculiar to meadows or prairies will somehow or other make their appearance and when by means of drainage or other causes a wet

area becomes dry plants suitable to the new conditions immediately appear. In the Peace River region a great variety of conditions exist in a very restricted area but even if the patch of alkali soil is only a few yards in extent or the dry hillside rises from among marshes and bogs the plants found are those characteristic of these conditions.

The trees found are those to be met with everywhere in the sub-arctic forest. The rivers are bordered by willows and balsam poplar (*Populus balsamifera*) while black spruce (*Picea nigra*) and tamarac (*Larix Americana*) grow in swamps and wet ground generally. The country as a whole is clothed with white spruce (*Picea alba*) and aspen (*Populus tremuloides*) and an occasional sandy ridge will be covered with Banksian pine, (*Pinus Banksiana*). There is almost no birch in the country except on or near the tops of the highest hills. None of the trees are large, 15 or 18 inches being the usual diameter for the largest spruces but though repeated fires have in many parts almost destroyed the forest there still remains an abundance of material for all the needs of the settler.

SOME BIRD-NOTES OF THE YEAR.

By G. EIFRIG.

A RED-LETTER DAY FOR WARBLERS.—The high-water mark in the spring migration of warblers was this year evidently reached on May 23rd. A perfect wave of warblers together with some thrushes, finches and wrens struck the city the night before this date. These lively and cheerful denizens of the tree-tops were very noticeable in the trees along our streets, in gardens and especially in those along the north side of the Rideau, where the bird army, coming from the low southern bank of the river would naturally strike first. In the afternoon of the above date, at three o'clock, I was in Lt.-Col. White's park, between Wurtemberg street and the Rideau. I have never seen so many birds and such a variety in so small a space before. In a spruce tree not over thirty feet high, I saw within about ten minutes, the following warblers: Blackpoll, Magnolia, parula, Blackburnin, bay-breasted, black-throated blue, black-throated green and the redstart, several

of each, besides some more in the top which I did not recognize quickly enough. Mourning and the rare Tennessee warblers had also been seen in the morning, when the number of birds is said to have been still greater. Together with these warblers had come the white-throated and white-crowned sparrows, and the olive-backed thrush, which seem to prefer the company of warblers during migration. Added to all these the robins, bluebirds and blackbirds which had established their households in the garden long before this date, they certainly made it a very lively picturesque place for a while.

A HERONRY NEAR EGANVILLE.—On the 26th and 27th I had occasion to visit Lake Doré near Eganville, Renfrew County. At one end of this lake there is an extensive swamp area, partly made up of cat-tail growth, impenetrable alike to foot and boat and partly of wooded portions, where there is more firmness underneath. Several so-called spring creeks roll their muddy, dark colored and slowly gliding waters through these swamy woods. On the banks of one of these creeks, several rods from where it enters the lake, is the heronry. It consists of about 100—150 nests, which are from thirty to fifty feet up in the swamp elms, which in this place had at so late a date no leaves whatever. The nests are bulky affairs, made of large sticks in the crotches and forks of branches. They look very insecure and top-heavy, especially when their large proprietors get up on them to survey the surroundings. When our boat noiselessly glided up the creek, the nests could be seen from far, but no herons, but as we drew nearer one loud squeak would sound and then more and the herons would slowly and reluctantly fly out of their nests, some would merely stand up to see what was wrong. If a shot is fired or a paddle splashed flat into the water, the uproar is instantaneous and great. Later on, when the young are out and must be fed, the tumult and uproar especially at night is something awful. At this time most had their four large green eggs in the nest, yet some had one or two of the young out already. That the nests of these ungainly birds, so high up, are not very safe is attested by the number of young and broken eggs lying among the trees. The only species seen was the blue heron (*Ardea herodias*).

SOME MORE LAKE DORÉ BIRDS.—Out on the lake several loons

(*Gavia imber*) could at all times be seen swimming and diving when the boat would approach nearer than about a quarter of a mile. Their floating, nesting locations, right on the edge of the cat-tail areas, could be seen but no eggs as yet. The herring gull (*Larus argentatus*) could be seen drawing its graceful circles over the lake. It certainly is a fine bird, snowy white below and pearly gray above. It nests here also, laying its eggs on some of the large rocks near the shore of Lake Doré and Golden Lake.

Among the remnants of last year's cat-tails could be seen the curious little long-billed marsh wren (*Cistothorus palustris*). They were busily engaged building their nests. These nests are works of art and are also quite large for such tiny birds. Each pair builds several of these nests, which are globular, with a small entrance, well hidden. They are fastened to old cat-tail stalks, 2 and 3 feet over the water and all lined with the down from the old disintegrating cat-tails of the fall before. The nests are 5 to 6 in. in diameter outside, and are very compactly knitted or woven of old and new cat-tail leaves and grass. Why each pair builds several nests when only using one for their eggs, is not known, whether it is to mislead their enemies, or to have places of shelter in different parts of their swampy domain, or for other reason is hard to say.

BOTANICAL CLUB OF CANADA.

The last meeting of the Botanical Club of Canada was held in the City of St. John, N.B., on June 23rd, 24th and 25th, 1904, during the meetings of the Royal Society of Canada. There was a good attendance of members and a few visitors, among the latter being Prof. W. F. Ganong, who gave valuable suggestions.

The work of the Club was discussed and it was decided to take up some new lines of work, in addition to the valuable phenological observations which have been so ably edited by Dr. A. H. MacKay for several years. As a means of learning what botanical work has been done in Canada and that the Club might be of use in the advancement of the Science of Botany in the Dominion, it was further decided to ask each of the Local Secretaries living in various parts of Canada, to prepare each year a short report on work that has been done during the season in their respective dis-

tricts, and before the next meeting (May, 1905) send this to the General Secretary, Dr. A. H. MacKay, Halifax, N.S., for incorporation in the annual report of the Club. In addition to the phenological observations it was thought that members of the Club might take up some other kind of definite co-operative work. The members present at the St. John meeting recommended that the special work for this season should be a careful examination of Volume I. of Macoun's Catalogue, and the preparation of a report on such extensions of range, or changes in geographical distribution of Canadian plants as had been discovered since the publication of the three parts forming Volume I. of Macoun's Catalogue of Plants (1883, 1884, 1886). It was agreed that it would be well if each local Secretary when reporting would make suggestions as to any other lines of investigation or special study which he thought would be useful in the development of Botanical science and suitable for the consideration of the Club.

It was further recommended that collections of the local floras of each province be made and kept in some central locality, such as the Normal Schools. The students of these schools during the term could be instructed and guided in the making of proper herbarium specimens of plants; and on their return to the various sections as teachers should be impressed with the advantage of working up the local flora of each section and making additions from these to the herbarium already started in the Normal School. Such collections would be advantageous from many points of view, but chiefly in the stimulus they would give to local botanists. If the grounds around each Normal School were sufficiently large, it would be a good idea to plant in them some native trees, shrubs, field flowers and ferns of the locality. These might well form an adjunct of school gardens, where established, and be an object lesson to show how well some of our native plants are adapted for ornamental purposes.

As the algæ (of our coast and inland waters), the fungi, lichens, mosses and ferns are scarcely known in comparison with our flowering plants, it would be well for students to turn their attention to these, especially as the best time for studying many forms such as lichens, fungi and algæ, is in the early autumn, when the interest in flowering plants has diminished.

OFFICERS OF THE BOTANICAL CLUB OF CANADA.

Elected on the 24th of June, 1904, at a meeting of the Royal Society of Canada in St. John, New Brunswick.

Honorary President :—John Macoun, M.A., F.L.S., Ottawa, Ontario.

President :—George U. Hay, D. Sc., St. John, New Brunswick.

General Secretary-Treasurer :—A. H. MacKay, LL D., Halifax, Nova Scotia.

SECRETARIES FOR THE PROVINCES.

Nova Scotia :—Principal E. J. Lay, Amherst.

New Brunswick :—James Vroom, Esq., St. Stephen.

Prince Edward Island :—John MacSwain, Esq., Charlottetown.

Quebec :—Rev. Robert Campbell, M.A., D.D., Montreal.

Ontario :—James Fletcher, LL.D., Ottawa.

Manitoba :—Rev. W. A. Burman, B.D., Winnipeg.

Assiniboia :—Thomas R. Donnelly, Esq., Pheasant Forks.

North-west Provinces and Territories generally :—T. N. Willing, Esq., Regina.

Alberta :—Percy B. Gregson, Esq., Blackfalds.

Saskatchewan :—Rev. C. W. Bryden, B.A., Willoughby.

British Columbia (mainland) :—J. K. Henry, B.A., High School, Vancouver.

Vancouver Island, B.C. :—A. J. Pineo, B.A., High School, Victoria.

J. F.

GIANT PUFFBALL —*Lycoperdon giganteum.*

Mr. A. H. Taylor, of the Customs Department, Ottawa, brought into my office this morning a fine example of the edible giant puff ball, Lycoperdon giganteum.

This specimen was obtained by Mr. Taylor on his property on Rideau street, Ottawa, where it had come up after the last rainstorm. It measures forty and a half inches in circumference one way and thirty-eight inches in the vertical diameter.

The colour is of an almost snow-white brilliancy and the surface for the most part smooth with shallow and inconspicuous wrinkles due to fissuring in the cortex or outer covering.

Two very large examples of this species were also observed last week on the Ottawa Golf Club links on the Aylmer road, the circumference of one according to the statement given me being fifty-nine inches.

The specimen presented by Mr. Taylor is now deposited in the Botanical Collection of the National Museum on Sussex street.

H. M. AMI.

Geological Survey Office,
Ottawa, Canada.

NATURE STUDY—No. XVII.

THE COLLECTION AND PRESERVATION OF BUTTERFLIES AND MOTHS.

By ARTHUR GIBSON, Division of Entomology, Central Experimental Farm, Ottawa.

It does not require much experience to collect insects. Some kinds of these interesting creatures can be found at all seasons of the year. Of the Lepidoptera, the moths, which as a rule fly at night, are by far the most numerous, and the months of June, July and August are the best to hunt for them. The first butterflies emerge during the early warm days of spring and continue to appear throughout the summer, some species flying late into the fall. The following directions, owing to limited space, are brief but are included in this Nature Study series in the hope that they may be of use to teachers and students who may care to collect these insects in connection with their work. Insect life is full of intense interest, and in the study of these beautiful creatures many practical Nature Study lessons can be drawn.

THE NET.—Butterfly nets can be bought from any of the dealers in entomological supplies. These range in price from $1.00 to $2.50. It is not difficult to make a net, however, and this can be done easily at home. One of the nets the writer uses, consists of a piece of cane 38 inches long, and rather more than ¼ inch thick. This is bent in the shape of a circle (fig. 1), the sides of both ends being shaved off to fit the upper square projections of a ferrule. An easy way of carrying the cane when not in use is to put it under the coat around the waist, placing the ends in the side trouser pockets. A light stick from 2½ to 3 feet long answers as a handle. Any tinsmith for a small sum will make one of these ferrules (fig. 2). The one I generally use is made

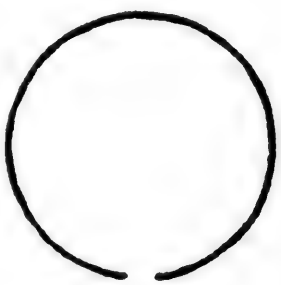

Fig. 1.

Fig. 2.

of tin, and has been in use for over eight years. For the bag of the net, ordinary green leno is serviceable. This should be first soaked in water to remove the stiffness. When dry again, it can be cut in shape similar to fig. 3, care being taken to see that it is well rounded at the bottom, so as to leave no corners. A piece of strong wide ribbon should be doubled and both edges sewed to the top, so as to make a passage for the cane to slide through to keep the net in shape.

Fig. 3.

KILLING BOTTLE.—Any wide-mouthed bottle of convenient size will answer. The old 2 oz. quinine bottles, which may still be had from most druggists for a few cents each, do well for general purposes; the common vaseline bottle is also good. Test tubes can be had cheaply from druggists, and may be used for the smaller butterflies and moths. Cyanide of potassium is the poison used for killing insects. This should be broken into small pieces and put into the bottle. If a vaseline bottle is used, just sufficient should be put in to nearly cover the bottom. On top of this should be poured some liquid plaster of Paris, not more than half an inch. Some collectors put in a layer of sawdust between the cyanide and the plaster of Paris. The bottle should then be left standing for a couple of hours before replacing the cork. The deadly poisonous nature of cyanide of potassium should be kept in mind, and care should be taken in handling it. It is also well to label the bottle POISON. Large moths, such as the Emperors and Sphingids, are killed quickest by oxalic acid diluted in water. If with a sharp pen dipped into this liquid the underside of the thorax between the bases of the legs is pierced, some of the acid will find its way into the body and cause almost instant death. Preparatory to this a few

drops of chloroform may be poured over the thorax ; this will stupefy the insect instantly, when it may be pierced with the pen dipped in oxalic acid ; the chloroform will soon evaporate and will not injure the specimen in the least.

COLLECTING.—With a little experience the collector will soon become expert in the use of the net. Of course, at first specimens will be missed and, even when caught, spoiled by careless handling; but practice will soon make perfect. It is impossible to lay down any rules as to where to collect. Butterflies do not all fly in the same places ; some kinds prefer sunny openings in woods, others swamps or the margins of streams, others again are found along railroad tracks, etc. The moths are to be sought for chiefly at night. Many begin to fly during the early evening and can be caught around flowers at that time. The electric lights on the outskirts of towns and cities attract great numbers, and here they can easily be collected. The method called "sugaring" is an interesting and productive way to secure specimens of many kinds of moths. The "sugar" is simply a mixture of molasses thinned with sour beer, which is smeared on the trunks of trees at dusk. These trees are then visited shortly afterwards and the moths there attracted collected. A dark lantern is of course necessary to enable one to find the trees which have been daubed and detect the moths upon them. When starting out, it is well to take some kind of a collecting box in which to pin specimens. An ordinary cigar box with a strip of cork glued to the bottom to receive the pins will answer. Special tin collecting boxes can be bought, but at first it is not necessary to buy these, nor in fact much other apparatus. Entomological pins, however, are a necessity, and these can be purchased in various sizes from the Entomological Society of Ontario, London, Ont.

MOUNTING —After having reached home the specimens should be mounted as soon as possible before they become dry. If they have dried, they may, however, be relaxed, by putting them in a receptacle containing some damp sand. An old vegetable dish does very well for this. For mounting butterflies and moths, spreading boards are used. These can be made by any one ; soft

wood, such as whitewood, or pine, should be chosen. Fig. 4 shows a section of the style we use. As the bodies of Lepidoptera vary much, different sized spreading boards are necessary. Our boards are of two lengths 18 and 12 in. In width they are 6½, 4½, 3¼, 2 and 1½ in., with body spaces ⅝, ½, ¼, ⅛ and $\frac{1}{16}$ in. wide respectively. Below the groove a strip of cork should be glued to hold the pin which has been put through the central portion of the thorax of the insect. When mounted, the insect should be high up on the pin, about one fourth of the pin above the specimen. The wings of butterflies and moths should be arranged as shown in fig. 4, the lower margins of the front wings forming as nearly as possible a straight line. With fine needles the wings can be brought forward and held in place by strips of writing paper or thin cardboard. No. 00 insect pin cut in two and the blunt end forced nearly all the way into half a match, makes a splendid setting needle. These pins are very fine and when used carefully to pierce the wings to hold them in position, the holes made are so small that they are practically invisible afterwards. Specimens should be kept on the spreading board at least a week or ten days, and the boards may be hung in rows on a wall, if a hook of some kind is screwed into the top of each.

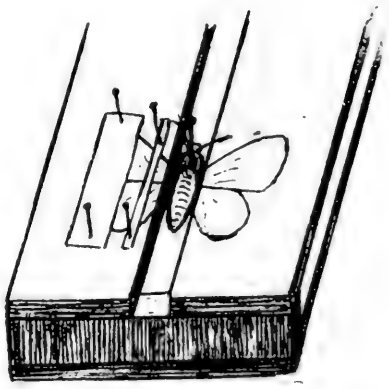

Fig. 4.

If it is not convenient to mount the specimens immediately after their capture, these can be put in envelopes and then stored away in a tin box until the opportunity arrives when they can be relaxed and spread. Fig. 5 shows the pattern of envelope used by entomologists for papering their captures.

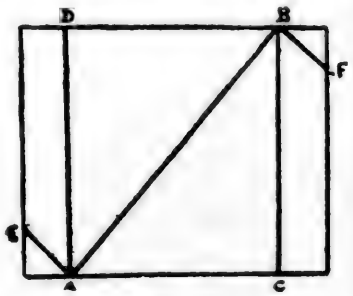

Fig. 5.

Method of folding paper for envelope. First fold on the line A B, then on A D and C B, and then on B F and E A.

These can, of course, be made in any size. The date, locality, and name of collector should always be plainly written on each envelope.

PRESERVING SPECIMENS.—When the specimen is removed from the spreading board, a neat label, bearing the locality, date of capture and name of collector should be put on each pin. Scientifically, a specimen is regarded as useless if it has not this information. If only a small collection is being made, mounted specimens may be arranged in ordinary cigar boxes, or any other kind of shallow box ; but it will be necessary to keep examining these constantly, as they are not, as a rule, tight fitting, and museum pests soon find their way into them and destroy the specimens. Insect cases may be bought from dealers and, if only a few are needed, probably would be cheaper in the end. These are of various sizes, and are lined with sheet or pressed cork, to receive the pins. The Schmitt case is recommended by many and is used extensively in the United States. If it is the intention to form a large collection of butterflies and moths, of course, it would be better to have a cabinet made, containing a dozen, or more, drawers, all similar in size and pattern. Most collectors like to have a series of at least four specimens of one kind of butterfly or moth. This is not always possible, as many are too rare ; but of the available species it is advisable to have two specimens of each sex, and also a specimen mounted so as to show the underside. Some form of deterrent to museum pests, as naphthaline or camphor, should be put in each case or box. A simple way is to make small bags of cheesecloth and fill these with ordinary flake naphthaline, pinning one in a corner of each box. If at any time fine dust is noticed under a pinned specimen, it is evidence that some pest is at work. In such cases a spoonful of bisulphide of carbon, or benzine, should be poured into the box, then the top closed quickly and left unopened for some hours.

A pair of entomological forceps will be found very useful in handling pinned specimens.

EARLY STAGES.—From a teacher's standpoint, collecting the immature forms and keeping them under observation until maturity will prove a most helpful way of arousing interest in insect life. In the fall of the year cocoons of the Emperor Moths

are often seen attached to the limbs of trees. If these are gathered and kept out of doors during the winter, and brought into the school in the early spring, the scholars will be interested in watching for the appearance of the moths. The cocoons of the Promethea Emperor Moth are usually to be found each fall on the lilac. Caterpillars of many kinds can be collected all through the season and with, a little care, reared to maturity. An easy way to obtain larvæ is to beat the foliage of trees and shrubs over an inverted umbrella. The greatest pleasure in entomology is the study of the life-histories and habits of species. The field is wide, and there is still a vast amount of work to be accomplished. The most useful work can be done in studying the early stages of moths. Only a small percentage of these have been thoroughly worked out, and careful observations recorded are of much importance. Specimens of the mature forms collected in the field, in many cases, are more or less rubbed or damaged, and always inferior to bred material. For few larvæ, ordinary jelly jars with tin lids will answer. Some earth should be put in the bottom of each jar, as many caterpillars pupate in the ground. Fresh food should be fed every day and care taken to keep the jars clean. If a number of the same caterpillars are being reared, larger jars will be necessary.

If at all possible, at least one specimen of each kind should be preserved for future reference and study. This is best done by inflation, and specimens thus prepared are more valuable than those put in liquids. Proper apparatus may be purchased from dealers in entomological supplies, such as : an oven, in which to dry the empty skins while being inflated ; a spirit lamp to furnish heat ; some glass tubes drawn out to different sizes at one end ; some clips made of watch spring and held to the glass tubes by means of a band cut from rubber tubing ; a double rubber bulb with about three feet of tubing attached ; and a pair of fine curved forceps. The process, briefly, is to (1) kill the caterpillar in a cyanide bottle ; (2) place it on a piece of blotting paper, cover it with a strip of the same paper, and gently press out, through the anal orifice, using the pair of fine forceps, all the body contents ; (3) attach the anal segment to one of the glass tubes, fastening it with one or two of the spring clips ; (4) connect the glass tube to the tubing of the double bulb and inflate the larval skin by gently squeezing the outside bulb, at the same, with the other hand, hold the caterpillar in the oven to dry. When perfectly dry, the larva should be carefully removed from the glass tube and mounted with shellac on fine wire, one end of which should be first wound several times around an insect pin. Naturally, at first specimens will be spoiled, but with care good results will soon be obtained. It is best to begin with hairless larvæ.

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THE BRITISH ASSOCIATION PRESIDENT'S ADDRESS, 1904.

By Prof. E. E. Prince, Dominion Commissioner of Fisheries, Ottawa.

No doubt many readers of THE OTTAWA NATURALIST will be interested to read a more adequate, if somewhat condensed, account of the remarkable address by the British Premier at Cambridge, England, last August, than the fragmentary references to it in our Canadian press. Hence the following notes have been prepared.

When that distinguished body of scientists, the British Association, met this year in England's famous seat of learning, Cambridge, it was appropriate that one of her most distinguished sons should be chosen President. The choice was unique, in that the *savant* chosen was also the Prime Minister of England. The name of Balfour is one held in special honor at Cambridge, for a younger brother of the Right Honorable Arthur Balfour was, until his tragic death in the Alps, the most brilliant biologist, excepting Darwin, that the ancient university has given to the world. The chair of Comparative Embryology, held by the late Professor Francis M. Balfour, has never been filled since his death. The reason, it has been said, is that no worthy successor has been forthcoming.

Premier Arthur Balfour has no mean reputation as a thinker and *littérateur*. The students of Scotland's oldest University (St. Andrews) elected him Lord Rector in 1886, and his rectorial address was a remarkable one in the field of literary criticism. Later, as Rector of Glasgow University, and at the present time, as Chancellor of the youngest of Scotland's Universities, viz: Edin-

burgh, Mr. Balfour has worthily sustained the distinction of his family name. His masterly treatises "Philosophic Doubt," "The Foundations of Belief," and other works, have given him eminence as a speculative philosopher. The late Principal John Caird, of Glasgow, once said, in my hearing, "It is easy to be a great philosopher in the company of scientists, and easy to be a great scientific man amongst philosophers; but Mr. Balfour is a great philosopher among philosophers, and a scientist among scientists." Of Mr. Balfour's real interest in science I have personal knowledge, and I well remember when I had the honor of first meeting him, that I was startled by his familiarity with a line of special zoological research in which I was at the time engaged, fifteen or sixteen years ago.

Cambridge which boasted a Newton, a Couch-Adams, and a Darwin in the past, and can claim to-day a Kelvin, and a Rayleigh and other leading scientists, was privileged to listen to a profound and closely-reasoned address on the Aim and Basis of Scientific Investigation from the President of the British Association, the membership of which Association this year exceeds 2,500.

The precise title chosen by Mr. Balfour was "Reflections suggested by the New Theory of Matter," and after pointing out that physical reality, not mere appearances or changing phenomena, formed the object of the highest scientific research, the President rapidly reviewed the ideas about matter which have prevailed since Newton's epoch-making "Principia" (published in 1687).

OLD CONCEPTION OF MATTER.

In the 17th century the average scientist regarded the universe as composed of ponderable matter, various in kind, permanent and indestructible: but capable of transformation by heat, chemical affinity, &c. Interstellar space in the vast heavens was conceived to be occupied by a thin, continuous kind of matter called ether, whose undulatory motions resulted in light, radiant heat, and electricity. Young's wave theory of light, a hundred years ago, led to the abandonment of such theories as Newton's light corpuscles or the emission by luminous bodies of material molecules which produced the sensation of light in the brain.

RECENT IDEAS OF MATTER.

In 1904 (a century later) the modern ideas as to the atomic and molecular composition of matter, the kinetic theory of gases, the laws of the conservation and dissipation of energy, so potent in 19th century science, have been surpassed by the latest affirmation that gross matter is, after all, a mere appearance, whose physical basis is electricity.

ELECTRICAL MONADS.

The chemist's ultimate atoms, whose groupings constitute the molecules of the chemical elements are now regarded as themselves groups of sub-atoms or monads. These are not electrified particles of matter; but are electricity itself. The different elements of the chemist are really different arrangements and motions of monads. "Thus" said Mr. Balfour, "two centuries ago electricity seemed but a scientific toy. It is by many declared to-day to constitute the reality, of which matter is but the sensible expression."

QUALITIES OF MATTER.

Formerly matter was said to have primary, essential qualities, such as shape and mass, which existed independent of any observer. It had also secondary qualities, like warmth and colour, which had no existence excepting as effects upon the organs of sense-perception in living beings. Mass is now pronounced to be no longer an attribute or a quality, but a relation. Far from being necessary and unchangeable, as was formerly thought, mass changes with every change in velocity, and especially at high rates of velocity. Professor Rutherford states that these corpuseles have a velocity in some cases 40,000 times greater than a rifle bullet which travels at the rate of about ½ a mile per second. (*Harper's Mag.*, Jan., 1904)

FEEBLEST FORMS OF FORCE CHIEFLY APPARENT.

Chemical affinity, molecular cohesion and the like, hitherto so important in the eyes of the physicist, are mere residual effects, the feebler manifestations of force as compared with the intense electrical forces which keep the atom in being. Gravitation, Newton's imposing discovery, is trifling compared with the attractions and repulsions of electrically charged bodies, while these, again,

are insignificant as compared with the internal attractions and repulsions of the electric monads. Each atom of matter is the theatre of energetic forces, however inert may be its external relations.

UNITY THE AIM OF SCIENCE.

"Will this bold attempt to unify physical nature last?" asked Mr. Balfour. A world built-up out of sixty or seventy eternally different chemical elements is just as rational a conception as if it were constructed out of a single medium : but men of science have always been impatient of multiplicity. Reduction of plurality to unity is a scientific instinct not to be ignored.

EXPERIENCE UNTRUSTWORTHY AS A SCIENTIFIC BASIS.

The President then considered the basis of experience upon which scientific research founds its laborious investigations. Scientists formerly held that to go behind experience was impossible, yet Faraday's disbelief in that *dictum* led to the modern electrical theory of matter. Gravity itself, says the physicist today, must be explained, it is no longer held to be an ultimate property of matter admitting of no explanation and requiring none. Matter itself, in masses or in minute particles, molar or molecular, is resolved by recent science into that which is not matter at all. The minute particle, called the atom, is a relatively vast theatre in which the sub-atoms or electrical monads perform their evolutions. The minuteness of these monads may be judged from Prof. J. J. Thomson's statement that radium throws off, as cathode rays, streams of these corpuscles, each of which has a mass of about one-thousandth part of the hydrogen atom and thus they are the smallest bodies known to science. (See *Harper's Mag.*, l. c. p. 279).

SCIENCE CONTRASTS WITH COMMON EXPERIENCE.

Matter, as viewed by scientists, could hardly be more divergent then it is from prevailing ideas or common experience, yet all science must inevitably be based upon experience, which is really but another name for the perceptions of the bodily senses.

EXPERIENCE WHOLLY ILLUSORY.

Starting from experience, scientific thought yields conclusions which prove experience to be misleading. "Our knowledge of reality" Mr. Balfour pointed out, "is thus based upon illusion,

and the very conceptions by which we describe it to others or think of it ourselves are abstracted from anthropomorphic fancies, which science forbids us to believe and nature compels us to employ."

INDUCTIVE THEORY INADEQUATE.

The school of John Stuart Mill held that the task of science ended if the sequences of our individual sensations were accounted for. Mill's "Logic" dealt with succession and co-existence in phenomena, with methods of agreement and difference, with the laws of nature as observed uniformities and nothing more. The inner character of physical reality was of no concern to science. This "thin intellectual fare" as the President styled it, is what was served out under the imposing title of Inductive Theory.

IF BODY AND MIND ARE EVOLVED WHAT FOLLOWS?

Our organs of sense (eyes, ears, touch, &c.,) inform us that there is a physical world: but science says the constitution of our organs, our eyes, our ears, &c., whose reports are really sense-perceptions, has reached its present condition by evolution or natural selection So also have our intellectual powers. Utility has decided everything; what is fittest alone survives. Man's physiological and mental outfit, adapted to the highest scientific inquiries, are due to blind forces, which have no prevision of loftier uses. The rudimentary instincts of the animal have thus been perfected into powers of analysis and calculation enabling man to mete out the heavens or divide the atom. The imperfection of man's ordinary beliefs and ideas, based upon illusory experience, may be due to these circumstances and to this genesis. Too accurate and direct a vision of physical reality might have been a disadvantage in the struggle for existence. Falsehood being, perhaps, more useful than truth, and living tissues (composing the organs of sense) being such imperfect material, no better results could be attained. This applies to the senses: but it must also apply with equal force to the intellectual powers.

SCIENCE GIVES NO COHERENT INTERPRETATION.

If evolution thus provides man with untrustworthy instruments for obtaining knowledge, or rather sensations, the raw material of experience; why should it succeed better in regard to reason, whose task is to turn experience to higher account.

Evidently something is wrong with the purely scientific explanation of the acquisition of truth and reality. As Mr. Balfour declared, there is "a certain inevitable incoherence in any general scheme of thought which is built out of materials provided by natural science alone." Knowledge, which science regards as the final outcome of irrational (animal) conditions, must be pronounced essentially rational, or science itself disappears.

As the speaker claimed, in an eloquent passage :—

"Extend the boundaries of knowledge as you may ; draw how you will the picture of the universe ; reduce its infinite variety to the modes of a single space-filling ether ; retrace its history to the birth of existing atoms ; show how under the pressure of gravitation they became concentrated into nebulæ, into suns, and all the host of heaven ; how at least in one small planet, they combined to form organic compounds ; how organic compouuds became living things ; how living things, developing along many different lines, gave birth at last to one superior race ; how from this race arose, after many ages, a learned handful, who looked round on the world which thus blindly brought them into being, and judged it, and knew it for what it was—perform, I say, all this, and, though you may indeed have attained to science, in nowise will you have attained to a self-sufficing system of beliefs."

Thus, the more complete seems to be our explanation of what we know, the more difficult it is to discover by what ultimate criteria we claim to know it. The President concluded by confessing that the dilemma was not one for physical science to remove, for here the confines of a territory were touched where philosophy claims jurisdiction.

If the senses and instincts of the lower animals are inadequate to yield a true conception of the universe in which we find ourselves, and if these, more refined and highly developed in man, are still unreliable and misleading in the ordinary human mind at any rate, and furnish, under the name of "experience" or "common sense," grossly erroneous conclusions as to the realities of existence, the resulting paradox is strange indeed. The latest product of human evolution, the scientific intellect, in its highest and most daring flights, is compelled to rely more and more, not upon actual common experience, but upon idealistic interpretations of the universe. Such interpretations transcend the crude reports of sense-perception : but they mould the results of experience and sense-perception into harmony with ideas, preconceived and necessary and full of light and satisfying meaning.

DISCOVERY OF THE EGGS OF SOLITARY SANDPIPER.

By WALTER RAINE, Toronto.

At last the long-sought for eggs of the solitary sandpiper have been found and it affords me much pleasure to be the first ornithologist to have the opportunity of recording its nesting habits, which are unique amongst North American birds, for I have positive proof that this species lays its eggs in the nests of other birds ; this being one of the most important discoveries in recent years in regard to the nidification of any American bird.

In "Nests and Eggs of British Birds Non-Indigenous," Mr. Chas. Dixon says of this species :—

"Incredible as it may seem the nest and eggs still remain unknown to science, for it is impossible to accept the description of the latter given by the late Dr. Brewer without authentication. There can be little doubt that this species lays its eggs in the discarded nests of other birds in low trees like its old world representative the green sandpiper is known to do, search should be made in such places in the summer haunts of the species."

I am aware that other ornithologists have previously recorded what were supposed to be eggs of the solitary sandpiper, but most of these records were simply conjecture and very unsatisfactory. The egg recorded by Dr. Brewer, according to the description that he gives, was doubtless that of the piping plover, the nest being found on the ground, and it will now be seen the solitary sandpiper does not make its nest on the ground.

Another supposed nest of this species was recorded by Dr. Clark of Kingston, Ont., in "The Auk" for Oct., 1898. This same nest was also recorded in THE OTTAWA NATURALIST for December, 1899, by the Rev. J. C. Young, but this nest was found on the ground and the parent was not secured. Mr. C. A. Reed in his work "North American Birds Eggs," figures one of these eggs found by Dr. Clark and it resembles a variety of the spotted sandpiper. The eggs of the solitary sandpiper are larger and more pear shaped than any spotted sandpiper egg I have seen, and the texture of the shell is very different to that of the spotted sandpiper, being a fine grain and polished ; then the ground color is pale greenish white, a tint never seen in a spotted sandpiper egg.

The genuine eggs of the solitary sandpiper are entirely different from spotted sandpiper eggs, in fact there is no American sandpiper egg that has the slightest resemblance to that of the solitary sandpiper. They bear a family likeness to eggs of the European green and wood sandpipers as might be expected, but of course like the birds themselves, the eggs are smaller than those two species of European sandpiper.

Now for my records which are absolutely authentic and thoroughly conclusive and establish once for all the fact that the solitary sandpiper does not lay its eggs on the ground, but deposits them in the nests of other birds often at considerable distance from the ground.

In the spring of 1903, I engaged Mr. Evan Thomson, to collect birds eggs for me in northern Alberta, and when the season was over he sent me notes on the specimens he had collected, amongst which was a record of finding a clutch of sandpiper eggs in an old American robin's nest built in a tree top.

I felt sure these would turn out to be eggs of the solitary sandpiper, and in due time the eggs were sent down and I saw at a glance, the eggs were new to me, but as they very much resembled a set of green sandpiper eggs in my collection, except being smaller in size, I was sure I had at last secured a genuine clutch of solitary sandpiper eggs. Several ornithologists who called to see my collection of birds eggs confirmed my opinion that this was a genuine set of this species. Amongst those who saw them, I may name the Rev. C. J. Young, Madoc, Ont.; Mr. Ed. Arnold, Battle Creck, Mich.; and Mr. Ed. Reinecke of Buffalo, N.Y.; but I thought I would wait for another year in the hope that Mr. Thompson would find another clutch and secure the bird, and in this he was very successful; as the following letter shows :—

"This season on June 9th, I found another set of solitary sandpiper eggs, this time in a grackle's nest in a low tree. I blew the eggs and left them until the next day, intending to return with my gun and shoot the bird, but on again visiting the nest, I found the eggs had gone, evidently the bird had removed them as I saw no trace of egg shells around. However, on the 20th June, I was still more fortunate, as I found another clutch and shot the parent bird as she flew from the nest and secured the four fresh eggs

This time the eggs were found in a cedar waxwing's nest in a spruce tree out in a swamp or muskeg."

The following is a description of these nests of solitary sandpiper eggs.

SET I.—Taken in northern Alberta, June 16th, 1903. 4 eggs advanced in incubation, collector, Evan Thomson. This set was found in an old nest of the American robin, built 15 feet up in a tamarac tree, that was growing in the middle of a large muskeg, dotted with tamaracs, the bird was flushed off the nest but unfortunately not secured. The eggs are exceedingly handsome and very different from the eggs of any other American sandpiper. The ground color is pale greenish white, heavily blotched and spotted, chiefly at the larger ends with vandyke brown, chestnut brown and purplish grey, the average size of these 4 eggs is 1.36 x 98, and they are very large for the size of the bird.

Set II.—Northern Alberta, June 9th, 1904. 4 eggs found in the nest of a bronzed grackle, built in a low tree; these eggs were unfortunately lost owing to Mr. Thompson first blowing them and then leaving the shells in the nest until he returned with his gun to secure the parent bird, but on his return on the following day, no trace of the eggs were to be found, the bird evidently had carried them away.

Set III.—Northern Alberta, June 24th, 1904. 4 eggs found in the nest of a cedar waxwing, which was built in a small spruce tree growing in a swamp, the nest being about 5 feet from the water, and Mr. Thompson was fortunate in shooting the parent bird as she flew from the nest, and thus identification is very complete and established the fact once for all, that the solitary sandpiper does not lay its eggs in a nest on the ground like other sandpipers, but takes possession of the nest of other birds, built in trees, just the same as its old world representative the green sandpiper is known to do.

The ground color of this clutch is also pale greenish white and the eggs are spotted with purpled brown, vandyke brown and purplish grey, and average in size, 1.36 x 99, thus it will be seen they average larger than eggs of the spotted sandpiper which measure about 1.34 x 90. Both clutches with the skin of the parent solitary sandpiper together with the nests are now in my

collection for the inspection of ornithologists. The finding of the eggs of the solitary sandpiper now makes the seventh species whose eggs were unknown to science until discovered by myself and assistant collectors in northern Canada. The other species whose eggs were previously unknown are Richardson's merlin, greater yellowlegs, belted piping plover, Nelson's, Leconte's and Harris's sparrows. The four latter species we found nesting in Manitoba, while the eggs of Richardson's merlin and the greater yellowlegs were discovered in Alberta.

OBSERVATIONS ON SOME OF OUR RARE BIRDS MET WITH IN 1904.

By Rev. C. J. YOUNG, Madoc, Ont.

In an earlier number of the OTTAWA NATURALIST, I recorded the appearance of the evening grosbeak in the neighborhood of Kingston in the months of February and March; also of the appearance of the horned lark at its usual time in spite of the bitterness of the winter. I will now refer to a few birds I met with this past season.

The goshawk is a not uncommon winter visitor to Ontario; it breeds occasionally, and is one of the earliest of our hawks to do so I have previously recorded a nest found near Perth in 1885. On the second of May, it contained three eggs, incubation commenced. On the 22nd April, in the present year, a nest was located in the township of Oso, while snow was still deep in the bush, and the ice on our lakes was strong enough for a person to cross; at that date the nest contained three fresh eggs, unspotted and of a decided bluish tint. Both of these nests were located in beech trees about 45 feet from the ground, as also was one observed in the township of Elzevir, which in June contained two well grown young ones.

The red-shouldered-hawk breeds regularly in N. Frontenac, but the further one goes north, the rarer this bird becomes. It is also an early breeder, laying in the latter part of April, and selecting any suitable tree, very often a maple, sometimes an ash, oak,

beech, elm, pine or hemlock, in all of which trees I have seen the nest.

The red-tailed-hawk is quite rare in eastern Ontario, I have no knowledge of its nesting along the St. Lawrence though I have seen the bird. In the rougher parts of the country northward a few pairs do so, and this year a nest was located in the township of Olden, in a high black ash, which on May 21st contained two eggs, highly incubated.

The vicinity of Sharbot Lake is the summer home of many warblers, and some of the fly-catchers. Of the latter I have observed the king bird, the great-crested, the olive-sided, the wood peewee, the phoebe, Traill's fly-catcher (Var. alnorum), and the least fly-catcher. Of the former, the yellow warbler, the myrtle warbler, the magnolia warbler, the black-throated green, the black-throated blue, the blackburnian, the palm warbler, the Maryland yellow-throat, the oven bird, the water thrush, the Canadian warbler, and the red-start, along with two or three varieties, that I could not identify, are frequent. All the above breed, and during the past season, I saw nests of magnolia, June 6th, in a small black spruce, containing four young ones just hatched; on the same date a black-throated-blue warbler's in a maple sapling, with two fresh eggs; also a red-start's with four eggs; and on May 27th, a water-thrush's just ready for eggs. But none of these birds is rare compared with the olive-sided fly-catcher, which I located on the 6th June, in the same black spruce swamp, where I found the magnolia warbler. In the open spaces, patches of arctis hnuckle-berry grow round the scattered spruces, and amid the springy moss, were the largest pitcher-plants then in flower, I had ever seen. A short distance away, outside a belt of spruces were many plants of the beautiful lady's slipper, *Cypripedium acaule*; and not far off the bright waters of Sharbot Lake. In a black spruce eighteen feet high, the olive-sided fly-catcher had established his home. The nest was built on a horizontal bough thirteen feet from the ground, and on June 6th, contained two eggs. Later, in the swamp on June 23rd, I found another of these nests containing three eggs, incubation commenced. It probably belonged to the same pair of birds, as it was not more than fifty yards from the first nest, but was built in

a much larger black spruce, on a horizontal bough, twenty-five feet from the ground. I had never seen this bird in its breeding habitat before, or had even met with it On the above occasion, while walking through the little swamp, my attention was attracted by its loud and singular call or alarm note. It would sit on the topmost dead branches of the trees and rapidly repeat three times syllables, which one writer compared to 'quirk,' 'quirk,' but which I thought more resembled three creaks of a rusty door hinge. The bird is very restless in the vicinity of its nest, continually on the move ; the nest itself is built of small, dry tamarac and spruce twigs, interwoven and lined with tree lichen and moss.

I might mention several other birds as met with in this locality, but space forbids, so I must leave them for the present ; I will only refer to the solitary sandpiper. I wrote a short paper on this bird, which appeared in the OTTAWA NATURALIST, of December, 1899. There I stated my observations on the bird up to that date (1899) and concluded with an account of a nest and three eggs found by me near a creek on Amherst Island, the identification of which I considered at the time absolutely indisputable. The nest was on a sandy knoll, near a creek ; the flight of the bird was peculiar, but what I most of all relied on, were the evident whitish features of the tail.

Subsequent developments however, lead me to suppose that my identification was faulty, for Mr. W. Raine of Toronto, received from Alberta, two sets of eggs, taken from the disused nests of other birds built in trees, which if his correspondent is correct, certainly belong to this species. I have seen one of these sets of eggs and am impressed with their resemblance to eggs of the greenshank, green and wood sandpipers of Europe, but of course they are smaller, as they should be. It should be remembered that Mr. Charles Dixon, the writer of 'non-indigenous British birds,' in writing of this species some years ago, said "there can be little doubt that this species lays its eggs in the deserted nests of other birds in low trees, like its old-world representative, the green sandpiper, is known to do." Dr. Brewer's record and my own with regard to these eggs are unsatisfactory.

As a supplement to my former paper, I may add I did not meet with the solitary sandpiper after 1899, until May 22nd, 1903, when

I saw a bird at a small lake in the township of Olden. This year 1904, I saw an unmistakable bird in immature plumage, with down still adhering, rise from a pool by the road-side in dense woods in the township of Kennebec, on 6th July. But as proof of their breeding in this part of Ontario, I will relate my experience this summer near Madoc, in the county of Hastings. I was driving past a road-side pool near a swampy meadow on 24th August, when several sandpipers rose, and alighted on the neighboring fence. I stopped the horse and watched them. They were a brood, four young with the two old ones: were very tame; they would fly down to the muddy pool, then alight on the fence again, would sometimes perch on a stump on the dead branch of a neighboring tree. I could get within eight or ten feet. I thought a photograph would be interesting, so I came another day, but could never get more than two on the fence together. I obtained photographs to that extent, after visiting the location on several afternoons. The last time I saw any of them was the 16th September. This brood was doubtless hatched in the vicinity, and having been undisturbed, will probably locate themselves there another year, if they survive the migration. I have heard from boys, whom I met near by, of a snipe's nest having been found last spring in an apple tree, and was assured by them that the bird flew out, and until they saw this nest they always thought the snipe made its nest on the ground. This had reference to the solitary sandpiper.

But not much dependence can be placed on such a statement, and until I see the nest, and examine any fragments of egg shell there may be in it, I only mention the statement for what it is worth.

Madoc, September, 1904.

THE CANADA JAY.

(By WM. H. MOORE, Scotch Lake, N.B.)

The Canada jay (*Perisoreus canadensis*) is one of our Canadian birds which is blessed with several local names. Some of these names are "camp-robber," "whiskey-jack," "moose-bird," and "gorbie," but speak of this bird as Canada jay to most of his human acquaintances and they know not what bird is meant.

The Canada jay is one of our most hardy birds. So hardy in fact, that not only do the adults withstand our severe winters, but they even build their nests and bring forth the young while snow still covers the ground. The nest is a compact affair, built of twigs, fine shreds of bark, and hair, and if wool is obtainable it is added.

The plumage of the young, is much darker than that of the adults, being sooty black throughout with a slight tip of white on tail feathers. The white of the head and neck is lacking until August or September, when they have assumed the same colored dress as the older birds, being greyish with white cheeks, throat and collar, forehead, and tip of the tail. When on the wing they seem to float on the air, rather than to be working vigorously with the wings as some birds do. A cause of prejudice against the Canada jay is the manner in which at times they obtain their food. They are much disliked by trappers and hunters, as they often take the bait from traps set for fur bearing animals, and also by feeding upon carcases of game hung up by hunters. Many hunters have lost shots at game on account of this bird giving a a cry of alarm when it sees a man, and as all of the wild neighbors partially understand the calls and actions of their friends, all know to be on the *qui vive* when an alarm-call is given. Campers also dislike its way of taking any bit of food that it can carry away, yet some campers delight in feeding the birds just to see them eat, and carry away what they cannot eat. Anything from a small bone, bread-crust, or piece of soap is acceptable to their needs ; whatever it may be, it is picked up in the bill, and while on the wing it is changed to a foot, and changed as easily

as you or I could change a like article from one hand to the other. But all do not live all the time by camp robbing, or trap-robbing. If they did many of the names applied to them would be well earned.

Let us see the Canada jay from an economic, a beneficial point of view. This will bring to light other habits and a different food supply. Small mammals, killed by the birds themselves, are part of the bill of fare, and insects in all stages of life form a large part of the menu even among camp fed birds.

The writer performed a surgical operation upon a Canada jay which had been in the habit of dining with a crew of lumbermen, and was much surprised to find that nearly one thousand eggs of the Lorset tent-caterpillar had been taken for breakfast. The chrysalids of this caterpillar are also fed upon, and in the autumn while the birds are migrating south they feed largely upon locusts, beetles, etc. The young taken in June feed upon beetles and caterpillars, species well known to the birds but unknown to the writer.

What real naturalists our wild birds are, knowing how, when and where to find and obtain their food supply, be it insect in any of its stages, plant forms, or other life. Were we able to understand our wild neighbors what a great amount of information could be gained regarding the life histories of many forms of life.

A most interesting entertainment to witness is when the Canada jay turns his attention to collecting mice. Not only is it interesting to witness but from appearances the performances is highly interesting to both jay and mouse. A Canada jay was heard shrieking and calling in such a manner as to call the attention of man. A mouse had been running over the snow from one burrow to another when it was espied by the sharp eye of the jay, who immediately gave battle by flying down and catching the mouse in its bill, whereupon the mammal turned upon its foe and prepared to defend itself by trying to bite the bird, but the jay seemed aware of such tactics and suddenly dropped its prey. The mouse sprinted for cover, but was again held up. These tactics were followed until the mouse had become too badly injured to run, when it was most viciously seized and pecked to death. With screams of vic-

tory the jay made his way to a stump where the mouse was added to various other products of Nature in the internals of Perisoreus. To sum up both sides of the case, for and against the Canada jay, I for one think we should put down the verdict thus : Canada jay highly beneficial from the habit of feeding upon insects and mammals injurious to the welfare of man.

There are three sub-species of the Canada jay, viz : (*Perisoreus canadensis nigricapillus*) having a blackish crown. Inhabiting the the coast region of Labrador north to Ungava Bay. (*P. c. fumifrons*,) in which the white of forehead is smoky colored, inhabiting Alaska.

(*P. c. capitalis.*) The white species, especially about the head, larger than *canadensis*. Rocky mountain region of U. S.

BIRD NOTES.

RUFFED GROUSE.

Dr. Fletcher's note in the December, 1903, number, reminds me of a similar incident which occurred some years ago at Beacon Hill park here, during the progress of a cricket match. One of these birds was flushed by a dog on the opposite side of the park and came flying over the field where it was terrified by the shouting and yelling of the crowd. It made straight for the nearest cover, where the Park Hotel stood, flying at a great velocity. The hotel door stood open and just opposite was a large mirror, the poor bird went through the door and against the mirror, falling dead on the floor.

J. R. ANDERSON.

Victoria, B.C., 4th January, 1904.

BIRD MIGRATION.

Mr. E. A. Wright of Ottawa, noted on the morning of October 9th, at 3.35 a.m., a migration of many thousand birds which from their note he took to be some species of plover. They continued to pass over for about an hour, when he fell asleep. Mr. Wright noted that the birds seemed to be flying very low, and from the difference in their note it was evident that some of them rested for a short time.

J. M. M.

NATURE STUDY—No. XVIII.

THE PRESCRIBED COURSE IN NATURE STUDY FOR PUBLIC SCHOOLS.

S. B. SINCLAIR, Ph. D.

The Easter meetings of the Ontario Educational Association held in Toronto, have for several years been devoted almost entirely to the consideration of new courses of study for Public and High Schools.

As a result of this investigation the regulations regarding the subject matter of study in these schools have been greatly changed. One of the most radical of the reforms made is the introduction of Nature Study into every grade of the Public School. The December number of the NATURALIST for 1903 contains an outline of the course which was proposed. As a number of alterations were made before adoption it has been thought better to give the following copy of the revised courses, which are now compulsory in the first four classes of the Public School.

Form I.

NATURE STUDY.—Animal life : General appearance and habits of pet animals, their care and food ; domestic animals on the farm, their care, habits and uses ; birds, their nesting, song, food, migrations in the autumn ; metamorphosis of a few conspicuous butterflies or moths.

Plant life : Work in school garden or in window boxes ; study of a plant, as a geranium or pansy, from slip or seed to flower ; caring for plants in pots ; buds, their preparation for winter, their development ; autumn leaves, collections, forms, tints ; economic fruits, collection, forms how stored for winter, fruit as seed holders, dissemination of seeds ; roots and stems, uses, comparison of fleshy forms, how stored for winter.

Life on the Farm : Harvesting, primitive and modern methods compared ; preparation for winter ; the barn and its uses ; activities of the farm during winter ; winter sports and social life on the farm ; the varied operations of spring time ; spring time as awakening to new life ; effects of sun and moisture on the soil.

Form II.

NATURE STUDY.—Course of Form I. continued. Animal life: Life history and habits of domestic animals and of a familiar wild animals, as the squirrel, chipmunk, robin, crow; earth-worm, habits, structure, uses; toad, habits, structure, uses; observation of live insects and their activities, comparison of young and adult stages.

Plant Life: Co-operative and individual work in school garden; cultivation of plants in pots with observation of the development of leaves and flowers, parts of leaves and flowers; change of flower to fruit and of fruit to seed; functions of the parts of flowers; the forms and uses of trees; activities connected with forestry and lumbering, with study of pioneer life and present conditions on the prairie.

Observation of farm, garden, and household operations.

Form III.

NATURE STUDY.—Course of Form II. continued.

Animal Life: Adaptation of different kinds of Animals to their respective habits and surroundings; birds, life history of types, habits of wild fowl in different seasons; fish, forms and uses of different parts of the body, food and how obtained; life histories of moths, butterflies, beetles and grass-hoppers; useful insects, as ladybird and dragon fly; harmful insects; Nature's insecticides.

Plant Life: Germination of seeds under controllable conditions and in the school garden and window boxes; opening of buds; study of the forms and functions of the parts of plants, and comparison of these forms and functions in different plants; observation of the culture of farm and garden crops and of orchard and shade trees; the observing and the distinguishing of the common forest trees.

Different kinds of soil, as sand, gravel, loam, leaf-mould and clay; experiments to ascertain how soils are composed, whether of mineral or of decayed organic material, and which best retains water. Additional phenomena of spring in the vicinity of the school, cause of snow melting, ice floating, etc.; how nature prepares the soil for growth of plants. Distinction between hard and

soft, pure and impure water ; tests and methods of impure water ; tests and methods of purification of water.

Sources of heat : Experiments to show the effects of heat in the expansion of solids, liquids, and gases ; practical applications. Temperature ; thermometer, construction and graduation Methods of transmission of heat, conduction, convection, and radiation ; causes of winds and ocean currents ; ventilation.

Form IV.

NATURE STUDY.—Course of Form III. continued Animal life ; relation of fish, birds, and wild animals to man ; life histories of conspicuous and economic insects ; organs and functions.

Plant life ; study of organs of plants and their functions ; study of economic and wild plants from seed to fruit in the school garden, home garden, farm and forest ; weeds injurious to crops and methods of destroying them ; buds and twigs : wood, rings, grain, and bark, uses, etc.

Observing local minerals and rocks, their properties and uses ; experiments to show composition of soils and their relation to drainage, temperature, etc. ; varieties of soils adapted to different crops ; fertilizers, etc. Implements and tools used on the farm and in the household, mechanical principles applied in their construction.

The atmosphere ; its composition ; combustion, simple experiments, study of candle flame products ; changes produced in the air by respiration ; reciprocal relation of plants and animals as regards the atmosphere ; impurities in air.

Gravity ; air and liquid pressure, the barometer. Cohesion and adhesion, the nature of these forces ; phenomenon of solution and diffusion ; amorphous and crystalline forms of matter. Practical use of heat, steam, and electricity, in connection with the study of industries.

Form V.

ELEMENTARY SCIENCE.—An elementary course in Botany, Zoology, and Physics.

For the details of the course, see Appendix B., p. 82 of printed Regulations of the Education Department of the Province of Ontario.

NOTE 1.—The objects of the course are to train pupils in correct observation and deduction; to give, in connection with the instruction in Geography, a fair knowledge of the world around them to those who will remain at school only a year or so; and to lay the foundation for the more detailed study of each subject in the case of those who will continue the work. The spirit of the Nature Study of the lower form should be retained, but the teacher should introduce a more systematic treatment of the subject with organization of the material in Botany and Zoology as will lead to simple classification. The course should be correlated with Geography, Drawing and Composition.

NOTE 2.—Under each of the sub-heads in Appendix B, full details are given of the courses. The order of the topic, however, is merely a suggested one. In Botany and Zoology, the extent and the character of the details of each topic are left to the principal and the teacher, and should be determined by the accessibility of the material and other local considerations The course in these subjects should be practical throughout. Each pupil should possess a good lens and be taught how to use it. Approved methods of collecting and preserving botanical specimens and of keeping live animals suitable for study should be systematically followed. An herbarium and a museum of local specimens should be provided where practicable. The pupils should be encouraged to provide specimens from the locality. Much of the practical work, especially the observations, will necessarily be done out of doors by the pupils alone, under the direction of the teacher, or by the pupils, conducted by the teacher. The course in Physics shall be experimental as far as possible, and the pupils should be encouraged to work at home and to prepare simple apparatus. The amount of the apparatus required is at the discretion of the Public School Inspector.

NOTE 3.—Books for reference and for supplementary reading should be provided in the school library. Systematic written descriptions and drawing should be required throughout the course, and the exercises should be dated and presented for comparison and inspection, the work being systematically supervised by the teacher. In none of the science subjects shall notes be dictated by the teacher.

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SUMMER WARBLERS IN COMPTON COUNTY, QUEBEC.

By LEWIS M. TERRILL, Montreal, P.Q.

The district in which the following observations were made comprises an area of about five miles in the vicinity of Bury, Quebec, a village in Compton County on the C.P.R. almost equidistant from Sherbrooke and Megantic.

Lumbering has only recently become extensive and the forests are still large, with coniferous trees predominant. The country is hilly and well watered, forming an ideal summer home for many warblers and other birds of a retiring disposition.

BLACK-THROATED GREEN WARBLER.—My notes on this species are based on three nests and if others should be found to continue in a relative similarity, a description of one would suffice. The first, found June 1st, 1902, was fastened, one foot from tip, on to limb of a small shrubby spruce, three feet from the trunk and six from the ground. The spot chosen was a side hill covered with a growth of young spruce and cedar. The nest, well hidden by an overhanging branch held four fresh eggs and was composed exteriorally of dead spruce twigs neatly interwoven with yellow birch bark shreds and lined with fine grasses and animal hair. Its inside diameter measured 1¾, outside 3 inches; inside depth, 1¾, outside, 2⅓ inches. The well rounded and finished appearance and the predominance of birch bark reminded me of certain vireos' nests. Two nests found later, on June 9th and 29th, were similarly situated and constructed and contained respectively four fresh and one addled egg. The eggs measure uniformly .66 x 49. are white distinctly and obscurely dotted, chiefly at the larger end, with varying shades of rufous brown and lilac and a few distinct spots of black.

BLACK AND WHITE WARBLER.—June 5th, 1902. I saw a pair which evidently had a nest near by. Not otherwise observed during the breeding season though common about the 10th of May.

BLACKBURNIAN WARBLER.—July 12th, 1902. I saw a pair in an open spot of spruce woods, caused by surveyors felling several trees whilst staking out a line. They were much disturbed by my presence and probably had young.

CANADIAN WARBLER.—I saw a pair June 5th, 1902, and noticed others at different times through summer months.

NASHVILLE WARBLER.—June 12th, 1902. As I emerged from spruce thicket into an alder grown portion of a blueberry swamp, I noticed one of this species fly from a mossy knoll and after considerable searching found the nest deeply embedded in the yielding side of the mound. It was a slight affair (the surrounding mosses rendering a more substantial structure unnecessary) of withered grasses, moss and rootlets, containing four young a few days old. I saw several others during the breeding season principally amongst the undergrowth in boggy places.

MAGNOLIA WARBLER.—One of the most common warblers in this district, breeding in localities similar to those that the black-throated green and myrtle frequent. A nest found June 5th, 1902, was fastened, six feet from the ground and four from the trunk, on to a well foliaged limb of a small shrubby spruce, situated on the outskirts of a hilly spruce-grown pasture land, almost surrounded with deep woods. The female was on the nest, which was composed of very fine blackened grasses loosely fastened with spiders' silk and lined with horsehairs, appearing very fragile and transparent, somewhat similar to nests of the chipping sparrow. It was well concealed by an overhanging branch and measured inside depth 1⅓, outside 1¾ inches; inside diameter 2, outside 3¼ inches. The eggs, four in number, averaging .63 x .48 and quite fresh, were washed on the larger ends with a pale shade of cinnamon brown encircled with a wreath of spots of rusty brown and lilac in varying shades, on a creamy white ground. On June 16th another nest 2½ feet from the ground resting on twigs of a small cedar brush, the topmost foliage partially concealing it, was composed of fine grasses, black rootlets and spruce twigs, loosely

bound with spiders' silk and lined with horsehair. Locality, a dense growth of small spruce, cedar, tamarac and alders, gradually merging into a large forest. This nest also held four fresh eggs, creamy white, encircled on the larger ends with a wreath of brownish purple markings, and averaging 66 x .49.

Other nests show that the eggs vary considerably more, in the coloring, than do those of the black-throated green warbler, one nest containing eggs finely dotted over the entire surface with light grayish brown. In this locality the Magnolia warbler commences building about the first of June and four eggs, I found invariably, to be the complement. Two nests noticed on the 15th and 20th of June contained young newly hatched.

MYRTLE WARBLER.—This species appeared to be more abundant than any of those previously mentioned, excepting, perhaps, the Magnolia. They commence nest-building about the latter part of May, about one week earlier than the Magnolia. Their nests are very substantial and warmly built, one found June 3rd, 1902, with five eggs incubation 1-5th, was composed chiefly of dead spruce twigs with a few grasses and rootlets, bound with spiders' silk and thickly lined with feathers and animal hair. It was four feet from the ground, built close to the trunk of a young slender spruce with scanty foliage, situated in a spruce grown pasture skirting the swamp. The dimensions of this nest were, inside diameter 2, outside 4 inches ; inside depth 1½, outside 2¼ inches.

Eight out of ten nests discovered were placed a few feet from the ground near the top of slender spruces, the characteristic material used being a predominance of spruce twigs with a lining of feathers. Five eggs, less commonly four, composed a set and it would be vain to attempt a description as they show great variation, though in one instance, when I was enabled to examine two sets laid by one female, consecutively on June 10th and 24th, the markings were similar, though curiously enough the second nest held five and the first but four eggs. The nest found on June 10th was disturbed, hence the second laying as this species, in common with other warblers, normally breeds, as far as I am aware, but once a year. Measurements also differ considerably, the largest found being .76 x .58 and the smallest .64 x .51, the largest being nearer the average. This warbler is one of thelast

of the family to leave for the south, large flocks remaining until October 20th. I saw a few feeding in an orchard in the village as late as October 24th.

CHESTNUT-SIDED WARBLER.—Arrives here during the second week of May and many remain to breed. Its nest is usually a slight affair of grasses and vegetable fibres placed in the crotch of some small shrub or sapling amongst deciduous second growth. A nest found June 7th was very compactly built for this species. It contained four fresh eggs and was placed in a triple crotch of a basswood sapling amongst undergrowth in a well timbered locality. It was two feet from the ground and composed of shreds of yellow birch bark. Coarse bleached grasses, well woven and bound with a large quantity of spiders' silk, ornamented with numerous basswood bud coverings and with fine rootlets and horsehair.

This bird showed great foresight in placing the nest, as it was completely hidden by a large basswood leaf, though a week previous, during development of nest and leaves, the nest was in plain view. In the several nests I examined in this district the number of eggs deposited was invariably four. The uniformity, with regard to the number of eggs in a set, of the several warblers enumerated, may perhaps be partially ascribed to the absence of that parasite the cowbird, which appears not very partial to newly settled districts notwithstanding an abundance of cows. I did not find any warblers' nests containing eggs of the cowbird, in fact the only individual intruded on was a bluebird, and in this instance the would-be cowbird did not mature as the egg, with three of the bluebirds, was frozen during the severe frosts of May 9-10th, 1902.

The American redstart and Maryland yellow-throat were fairly common, though not nearly so abundant as in Montreal.

The yellow warbler, one of the most common summer residents in Montreal, was notable by its absence, as I did not see a single specimen either as summer resident or migrant.

One nest of the ovenbird was found July 1st, 1902, not arched though built higher on the side furthest in the hollow of the mound in which it was located, containing four eggs. I found this species fairly common in damp woods, and their song was very noticeable at night from 9 to 11 o'clock, during the breeding season.

UNUSUAL NESTING SITES OF THE AMERICAN MERGANSER (*Merganser americanus.*)

By WALTER RAINE, Toronto.

In all works on North American birds, nests and eggs the nesting situation of this species is given as being in a hole in a tree, after the manner of the hooded merganser, buffle-head, American golden-eye and wood duck. I was therefore very much surprised to find American mergansers nesting in holes under boulders on an island in Lake Winnipegosis, Manitoba, during June, 1903.

My son and I found about 30 pairs nesting on Gun Island on June 16th. All the nests that we could reach were built far back at the end of dark passages under boulders on the highest part of the island, some nests being from four to six feet back from the entrance and were hard to get at; in some cases my boy had to crawl between the boulders to reach the eggs and I had to pull him out by the feet. In one hole he caught a female on the nest, and afterwards my boy tied a fishing line to its leg and let it swim around the boat. It was astonishing with what speed it cut through the water using its wings and fairly flying under water, after which we gave it its liberty and it flew away. The nests contained from 8 to 12 eggs, one nest containing as many as 13. They are easily distinguished from other duck eggs by their very large size and pale buff tint, averaging 2.60 x 1.80. One nest contained eggs laid by two females as half the eggs were of a deeper tint and different size and shape than the others. The down is pale greyish-white after the fashion of all other ducks that nest in holes in trees or in the dark. The male mergansers flew away as our sail boat approached the island, but the females sat close dashing past our feet as we scrambled amongst the boulders where they were nesting. On this same island several red-breasted mergansers had nests containing 8 and 9 eggs each; their nests were not at the end of burrows, but in depressions under dense undergrowth. The eggs are smaller than those of the American merganser and of a darker tint, being yellowish-drab or warm drab; average size 2.50 x 1.70. The down is also

darker and of a warm greyish tint. Both ducks are very destructive to fish and are therefore disliked by the fishermen. They are known to gunners as sawbills, and their flesh is rank and unpalatable.

ORNITHOLOGICAL NOTES.

During the past season I investigated an unusual nesting site of our common black duck (*Anas obscura*). This well known and extensively distributed species usually builds its nest on the ground, but last June I visited an island in the St. Lawrence where a pair had taken possession of a last year's crow's nest and successfully brought off their brood. The nest, which was built after the usual style of crow architecture, was saddled on a limb of a hugh elm, forty feet from the ground, and was reached after a difficult climb with climbing irons. A liberal supply of down had been furnished by the duck and incubation was well advanced. Just how frequently such nesting sites are resorted to by these ducks it is difficult to say; had the bird not been accidentally observed flying to the tree her presence would never have been suspected. I photographed the nest containing the ten eggs, but owing to the extremely awkward position in which I had to make the exposure only eight are shown. The duck sat very close and did not leave the nest until I was within a few feet of it.

THE BLACK GUILLEMOT (*Cephus grylle*).—June 10th last, while walking along the harbor front, I saw a black guillemot swimming rapidly toward the open lake. I believe this is the first instance of this species having been observed in this locality. Speaking of this bird in 1885 the late Mr. McIlwraith, in "Birds of Ontario," says one was shot in Hamilton Bay many years ago, and according to the Catalogue of Canadian Birds one was taken at Toronto in 1885. These seem to complete our records for Ontario. While at the Magdalen Islands last year I saw many flocks; they are swift flyers and expert divers. Unfortunately, a large percentage of the guillemots that occasionally stray as far west as Lake Ontario die of starvation, so often the common fate of sea birds that wander so far from their natural habitat.

E. BEAUPRÉ.

Kingston, Oct., 1904.

AN OCTOBER TRAMP.

Lured by the glamour of a recent morn, which presaged a bright invigorating day, I started at eight o'clock for a tramp to Kirk's Ferry, where the charming scenery of the Gatineau river and the Laurentian hills is admirably exhibited. This very diversified and picturesque district holds many attractions for the naturalist and nature-lover. Through its broken ridges and swamps, the deer are still not uncommon, especially in the neighbourhood of the beautiful lakes which lie a few miles to the westward (Meach, Harrington and Phillips). From these retreats they sometimes stray, or are driven, even nearer to the city, as it was my good fortune to observe on this tramp. When half way up the long hill (which gives pause to many a cyclist) opposite Wright's Bridge, I heard the yelping of dogs coming up from the deep wooded ravine through which the Old Chelsea brook flows down to the Gatineau. Halting for a moment, I was greatly surprised to see a doe and fawn go bounding by on the other side of the ditch, their white tails flashing among the roadside weeds and brambles. They did not seem to see me, but disturbed by a wagon a few rods ahead they separated, the doe going off toward the river and the fawn turning to the left down through the gullies. The noise made by the dogs upon their trail showed that the pursuers were not hounds, and when they came in view, toiling heavily along, they proved to be a spotted coach-dog and an old collie. They went off upon the trail of the fawn, but I was glad to think that they could hardly overtake even this poor little creature. Surprised to witness a chase within less than five miles of the Parliament Buildings, my wonder was augmented upon gaining the plateau at the top of the next hill (at the pine grove where such a good view offers of the Chelsea rapids) to see another doe coming down through the field, as if to cross the road toward the river. It was running almost straight for a wagon full of hunters from Hull, but startled by their stopping and jumping down to get their guns out of the wagon, it turned and ran down inside the fence toward me. My sympathies being with the harassed and timid animal, I crouched down by the fence, and when it came by at arm's length I jumped up and waved my coat,

to frighten it back into the woods. It ran to the end of the field and then crossed the road and went down over the hill side. Two of the gunners came up and asked me where it had gone but I merely said that it had crossed the road, upon which they went down through the thick scrub some distance from where the deer went in, and having no dogs I knew there was little fear of them finding the quarry. Near Chelsea, in the cone-laden pines, squirrels were feasting upon the seeds, which they deftly extracted from the long cones held upright like tapers before them. The road here winds through a rich piece of woods, offering a welcome shade to the way-farer in midsummer. Unfortunately the axe of the woodman has already made considerable ravages among the maples, beech and oaks. Some ledges of rock, faced with various mosses and lichens and crested with a luxuriant growth of polypody, suggested that a new locality might be found for the dainty walking-fern. My quest extended some distance from the road, but in vain. A large hawk was working among and over the trees beyond and apparently made a kill, as it settled on a limb and evidently tore its prey to p eces. The bird was so hidden by intervening trees that the species could not be made out, but it appeared to be dark above and very pale beneath. The squirrels here were feasting on the fallen beech nuts, and bluejays with brilliant plumage and ugly voices fluttered from place to place. There were numerous juncos and occasional sparrows creeping about among the fallen leaves, but the bluebirds, so abundant a fortnight before had evidently departed. A partridge next flew up from the roadside and sailed off with a noisy whirr of wings, and while I strolled on slowly looking carefully around for any others, I saw standing in a little glade about thirty yards from the roadside a fine large doe, much larger than those previously seen. It was standing broadside to me in full view, the trees being scattered and leafless, and was calmly contemplating me. After looking at it for some minutes I decided to frighten it back into the bush as I knew if the hunters came along and saw it in such an exposed position its health might suffer. Waving my arms did not disturb it and it viewed the waving of a coat with no more sign of alarm. When I started to go nearer through the rustling leaves it soon cocked up its tail and bounded back over the ridge

to temporary safety. Kirk's Ferry was reached without further incident, and the Gatineau was seen to be unusually high. The hills along the river had lost nearly all the bright colours that clothed their sides so brilliantly two weeks before, for winds and rains had left few leaves upon the trees. After dinner I returned by the back road through Old Chelsea, and down past the old iron mines. Several gunners were seen and shots heard in the hills but no game appeared. Three examples of the Canada jay were noted; one near Kirk's Ferry, one on the road to Old Chelsea, and one about a mile nearer town than that hamlet I can recommend to our naturalists such a twenty-five mile ramble as pleasant, profitable and health-giving.

W. H. H,

BOTANICAL BRANCH.

The first meeting of the Botanical Branch since the early summer was held at the residence of Mr. W. T. Macour, on the evening of Nov. 4th. The members present were Messrs. Fletcher, John Macoun, Whyte, Clarke, J. M. Macoun, St. Jacques, Edward Cameron, Roy Cameron, Attwood and Campbell. Mr. Willing of Regina and Mr. W. H. Harrington were present as guests.

The subject chosen for discussion by the chairman was "Individuality in Plants," and in order to introduce it he read extracts from an address delivered by Prof. Hugo de Vries at the Convocation of the University of Chicago, Sept. 2nd, 1904. Prof. De Vries holds that new species of plants originate from accidental forms or sports rather than as described by Darwin in his theory of evolution In his address, Prof. De Vries gives an account of his observations on Lamarck's evening primrose, a close ally of the common evening primrose. He observed that while the type persisted, sports presenting specific characters were frequent, and in the discussion which followed the reading of these extracts Mr. W. T. Macoun mentioned that he had seen some of these new species in New York. Some of the members present thought Prof. De Vries' selection of a plant to observe unfortunate as the *Œnothera biennis* group have very long been

known to exhibit a wide range of variation in individual plants. It was decided to secure further information on this subject and discuss it at a future meeting.

Dr. Fletcher told of the efforts that were being made in Argenteuil Co. to prevent the further encroachment of drifting sand on cultivated lands there, and exhibited branches of Canadian balsam which had thrown out roots when the sand reached them. These roots would not only serve to add to the food supply of the tree but in the event of its being killed young trees would grow from them. *Spiræa salicifolia*, which grows in the depressions among the sand was mentioned by Dr. Fletcher as being an evidence that the "drifting sand" is dry only on the surface.

Mr. W. T. Macoun exhibited specimens of apetalous apple blossoms. About a dozen flowers were received by him, May 26th, in clusters averaging three flowers each. The calyx was very similar to that of ordinary apple blossoms but the petals were abortive, very small and hidden by the sepals. The flowers were evidently all pistillate. There were 15 stigmas on each flower.

BIRD MIGRATION.—With reference to the note on Bird Migration which appears on page 144 of THE OTTAWA NATURALIST for October, I can fully confirm Mr. Wright's observation as to the immense flocks of evidently small birds passing over the city on the morning of 9th Oct. Sleeping in an upper room with my window wide open I was awakened by their notes and listened to them for a long time. While they were passing I heard the clock in the Parliament Buildings strike three. About an hour later I again heard them for some time. My scanty knowledge of bird-notes did not enable me to recognize the species.—W. H. H.

REVIEWS.

CONTRIBUTIONS TO CANADIAN PALÆONTOLOGY, Vol. III.—ON DRYPTOSAURUS INCRASSATUS (Cope), FROM THE EDMONTON SERIES OF THE NORTH-WEST TERRITORY. Part III., July, 1904. By Lawrence M. Lambe.

The continuation of the Reports on vertebrate palæontology of the Geological Survey of Canada is most welcome. Following Part I. by Professor Cope on the mammals of the Cypress Hills Oligocene beds, and Part II. by Professor Osborn and Mr. Lambe, chiefly on the reptiles of the Belly River series, Alberta, comes the interesting memoir of Mr. Lawrence M. Lambe on the large carnivorous Dinosaur of the Upper Cretaceous, Edmonton or Laramie beds. In the meantime Mr. Lambe has received the well earned title of Vertebrate Palæontologist.

The two skulls described here were found many years ago in the Edmonton series of Alberta, and were identified and described by Professor Cope as specifically identical with *Lælaps incrassatus* which had been found in the somewhat older Judith River beds of Montana. Professor Cope published a brief description without figures, and as we knew little of the cranial characters of the Upper Cretaceous Dinosaurs, Mr. Lambe's full description and figures are of very great interest and value.

As restored by him the skull in proportions is remarkably similar to that of the small Tuatera lizard of New Zealand enlarged to a massive and formidable scale, that is, the facial region is less elongated than in the carnivorous Jurassic Dinosaurs, which seem to be closely related if not ancestral to this Upper Cretaceous form. What is lost in length, however, is gained in strength and power, proof that the Upper Cretaceous carnivorous Dinosaurs were thoroughly capable of attacking the huge horned Dinosaurs (the Ceratopsia) of the same period. These particular specimens are of a somewhat smaller and lighter construction in the feet than others which have been found farther south, and there is evidence of considerable specific if not generic variation among these animals in adaptation to the capture of the many different

forms of herbivorous Dinosaurs which existed at the same period. In his description of the jaw Mr. Lambe figures the presplenial. Professor Williston considers that this is simply an anterior expansion of the splenial.

HENRY F. OSBORN.

MONOGRAPHIE DE L'ILE D'ANTICOSTI. By Joseph Schmitt. Paris. 1904. pp. 367.

From whatever standpoint it may be considered, Dr. Schmitt's monograph must be considered one of the best works of its kind published anywhere, and nothing approaching it in completeness has ever been published on any part of Canada. Whatever one may think of such a large part of our country as Anticosti being owned by a single individual, one cannot but feel grateful to M. Menier for having made the publication of such a work possible. Paper and type are excellent and scattered through the book are many illustrations, charts and maps which in themselves would serve to give one a very good idea of the physical features of the island. Dr. Schmitt's long residence in Anticosti and the large collections he has made in all branches of natural history, enabled him to discriminate between what were trustworthy and what were doubtful among the published records, and that these were all consulted is evidenced by the very complete bibliography which concludes the volume.

The first part of the monograph is devoted to the geography and history of the island, and the account of its discovery and settlement is given in considerable detail. Under the heading "Meteorologie" the climatic conditions are considered, and Dr. Schmitt's conclusions are based on careful and complete observations extending over several years. The sections devoted to palæontology, botany, ornithology and entomology contain lists of all the species known to occur on the island, with localities and collectors' names, and in all branches of natural history notes on distribution and other information is contributed by the author himself.

J. M. M.

NATURE STUDY—No. XIX.

NATURE STUDY AND THE CAMERA.

By FRANK T. SHUTT, M.A.

As we understand the term, popularly, to-day, Nature Study is primarily and essentially the study of the out-of-doors. Therein lies its great fascination and charm. It takes us out into the sunshine and fresh air—and that is wherein it differs from our ordinary scholastic work. Away—body and mind—for the time from bricks and mortar and books and desks to learn what we can of the form and life and habits of plants and animals, to consider the meaning of the rocks and the soil, the clouds and the rain, but what is of far higher value, to realize as we have never done before the beauty of form, of motion and of color in the things about us—that, in part, is the essence of Nature Study and what it helps us to do. Forest and field, river and stream, the earth and the sky, all may be made to contribute towards this knowledge and all looked at aright may help us in the recognition of the beautiful and thus add much to the enjoyment of life. Our eyes and our mind are opened to the beauty of the things about us. There is created or developed within us a new sense—the realization of the beauty that lies in form and color.

Now, it is evident that the first step in Nature Study is to correctly observe. This is by no means such an easy matter as many may suppose. It is a rare art, though a fascinating one. It not only requires time—one might say, leisure—and concentration of thought, but also practice. To a certain degree it is a gift, born in us, *i.e.*, that we differ, naturally, in our ability to see clearly and accurately and take note of the things about us, but like all gifts it must be developed and trained before it can reach its highest attainment. Moreover, it is an art that can be acquired even by those who by nature are in a large measure unobservant—and we believe that to such, especially, is this study one of great value. How many of us go through life without making a clear mental concept even of the trees and plants passed and repassed almost every day, so much so, indeed, that some have never recorded (mentally) the difference in contour between an elm and a maple!

But Nature Study does not stop at car ful observation and the formation of distinct and true mental pictures. It leads to a knowledge not only of the structure but of the functions of living things. It continually puts the questions, why? and wherefore? and thus educates or draws out that valuable art of deduction, without which our observations would be of little service—without which half the value of Nature Study would be lost. Of this feature, however, it is not our present intention to speak further, but rather to bring to the notice of the earnest and enthusiastic student the camera as an aid and adjunct to careful, accurate observation. The making of a photograph—and by the making I include the taking, the dark room work and the printing—serves to impress the image of what we have seen upon the mind and memory as nothing but making a drawing can—emphatically and accurately. The mere focussing on the ground glass of the tree, a clump of fern, the bird on her nest, serves to imprint the image on the memory more accurately, vividly and permanently than does the casual glance at the objects themselves. How much deeper and more lasting is the image after the finished print is made! The writer found in his college days that it well repa'd to write out his lecture notes, even though the manuscript might never be reviewed—and in later days he finds the same principle still holds good with Nature Study and the camera.

All this, valuable as it is, however, does not comprise all the benefits to be derived from the aid of the camera. Though Nature Study is, as we have said, primarily for the out-of-doors, it frequently calls for subsequent work indoors to a more complete understanding of the objects of our study. In the photograph, carefully made, we have a record for this purpose. We cannot bring home with us the clump of towering trees, but in the image so accurately made by light we can again and again consider and compare their mode of growth, their contour and many other features. The same truth is still more obvious in geological studies. The rock cuttings showing the various strata, the escarpments and boulders can only be brought home for future study by the camera. And what shall we say of the fugitive clouds that, unconsciously to most of us, make the beauty of the landscape? We must secure the image ere the substance goes,

and that quickly or we shall be without an aid to our imagination for enjoying again the pleasures of the cloud-flecked sky. And as the highest enjoyment is only obtainable when accompanied by knowledge, we may add there is much to be learned from cloud formation and cloud forms, from the utilitarian as well as from the æsthetic standpoint.

Again, we can live again and enjoy the pleasures of our summer studies and rambles in our photographic records, and thus obliterate in part the severity and the monotony of our long winter. Not that the study of nature must necessarily cease in that cold and snowy season. There are a thousand objects still to interest and instruct us in the forest and by the stream, even when the white mantle lies deep upon the ground. One could easily enlarge upon this phase of Nature Study—one that has as yet received but little attention.

All knowledge is relative, or practically so. We learn by making comparisons. What more necessary for this than the possession of records? Of some objects, by their very nature, we can only obtain their image and for this photography is particularly helpful—indeed indispensable. That this fact is now widely recognized we have only to note the wealth of photographic illustrations in all works now published on the Natural sciences.

But perhaps enough has now been said to awaken an interest in the erstwhile photographer, who years ago may have bought a kodak, pushed the button and let somebody else do the rest. That camera, perhaps, was long ago relegated to the garret. Unfortunately, the cheapness of the instrument and the ease with which a part of the picture making could be done has served, with many, to make the camera little better than a toy and its manipulation the merest pastime. Naturally with them the camera has gone the way of the crokinole board and table tennis—it was amusing for a time, but soon became tiresome and was put aside. No, the camera must be used seriously, if it is to be with us a life work and a life pleasure, and it is very much to be doubted if any subject or study can afford so much of interest and value and pleasure as the study of Nature in her manifold manifestations.

And, in conclusion, it may be useful to give a word or two of

practical advice to those who having some skill in photography may desire to use that skill in the study of Nature. To be successful, both from the standpoint of making records by the camera and of making real progress in our study, do not attempt at first to work in many fields. Select one or two subjects, and, as far as possible, exhaust them before taking up another. An odd fact or picture gained here and there from many subjects, may in time make a collection of some interest and occasional value, but not to be compared in either interest or value to a systematized knowledge and a complete record of one or two subjects. Concentrate, then; diffuse work seldom leads to mastery, to satisfaction or success. Choose a subject and as far as opportunity permits study it seriously, in general and in particular, before beginning the exploitation of another, is the advice of one who has had some experience following this method. For instance, let us take the deciduous trees in our neighborhood. For contour, they should be photographed in full foliage and after the leaves have fallen, isolated and growing under forest conditions. Making negatives from the same point of view in summer and winter is most useful. Then make a study of the barks of the same trees. Follow this by a study and the making of careful photographic records of their flowers and seed vessels—an interesting work and one that will put us in possession of a wealth of most fascinating pictures to be treasured alike for their beauty and educational value. Finally, take the leaves, either singly or on a small branch; study and memorize their shapes and peculiarities and make photographic records of them. In this alone there is two or three season's work, even though but half a dozen trees be studied. It will not only afford much interesting and recreative in-door and out-of-door work, but will give us such a knowledge of our trees as few to-day possess. And the probabilities are that we shall also have many beautiful photographs that will delight and instruct us and our friends.

Subjects might be mentioned without number, but they will occur to every earnest worker. Our object was to indicate how the camera may be made of valuable assistance in the study of Nature, and in this we trust we have been in a measure successful. Photographic work and Nature Study are mutually helpful—they progress together—and the writer can honestly affirm that the pleasures and usefulness of both the art and the science are enhanced by their happy combination.

Experimental Farm, Ottawa, Nov. 15, 1904.

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THE WINTER FRINGILLIDÆ OF NEW BRUNSWICK.

By WM. H. MOORE, Scotch Lake, N.B.

The list of birds given below includes the members of the finch and sparrow family which occur in New Brunswick, during the months of December, January and February. During these three months migration is as nearly at a standstill as at any time during the year. This family is represented by more species than any other family of birds at this season So far as known twelve species may occur here during the winter, in greater or lesser numbers, being sometimes plentiful and even abundant and in other years rare. The winter of 1902-3 brought several surprises. The regular winter birds were no more plentiful than common, but some of the summer birds remained throughout the winter, and were really more common than is usual during summer. This fact caused the writer to believe that migration is not governed by temperature alone, but more by the food supply. That winter the conifers, birches and alders carried a good supply of fruits upon which the *Fringillidæ* fed. During the summer of 1903 it was noticed that there were no new cones upon the coniferous trees, and a nearly birdless winter was predicted to follow. The prophecy was correct, the birds were very scarce in this section throughout the winter of 1903-4.

PINE GROSBEAK. *Pinicola enucleator.*

This is a rather rare summer resident throughout the southern half of this province. They come south in autumn in flocks of from three or four to fifty. By people little acquainted with birds they are often mistaken for robins. Their habit of living in summer in coniferous forests, generally far from the haunts of man,

causes them to have little fear of him when they come south, and one may approach quite closely to examine them.

Their food in winter consists of almost any of the persistent fruits. A favorite food is the seeds of the mountain ash, which they pick from the trees and even from the ground where they have been blown by heavy winds. This winged fruit they dissect taking only the meat. Apples left upon the trees are also eaten. At times the pulp is cast away and only the seeds eaten, and again their crops have been found to contain the pulp. They also feed upon the fruit of the sumach. Their never failing diet is the tips of twigs of the fir trees. These tips are bitten off, and to reach them the birds at times hang nearly upside down, as the lithe limbs bend with the weight of the birds. When this food has been eaten the bill is coated with balsam. Elm buds also are eaten after they begin to swell in spring.

The flight of the pine grosbeak is slightly undulating, and when on the wing they often emit a soft loud whistle, by imitating which they may be induced to alight near by. Some ornithologists claim that this species nests far north, and so early in the spring that the eggs are laid before the snow has gone. This may be true, but it is also true that they breed in New Brunswick in the month of July.

PURPLE FINCH *Carpodacus purpureus.*

This species is in appearance a small edition of the pine grosbeak. The males much resemble each other in color, but the females and young males of the purple finch lack the yellowish breast and rump of the grosbeak. This species stayed throughout the winter of 1902-3. They were often heard to sing, but the song lacked the energy that is given it during the nuptial season. The song of the young male is not so rich as that of the adult male, and consists of a few short notes in place of the long, flowing song of adult. The males do not attain the purple plumage until the second year. Their food in spring is buds of various trees, the favourite being those of the poplar and the balsamy buds of the fir ; later, insects are added to the bill of fare. An adult male was observed in October eating the woolly aphis which infests alder bushes. Although arriving from the south early in spring the nesting season is deferred until after the middle of June.

ENGLISH SPARROW. *Passer domesticus.*

This species lives in winter in towns and villages. The families raised throughout the country in summer return to their winter quarters during October. A few pairs nest even in winter. In April they begin to scatter about the country again.

RED CROSSBILL *Loxia americana minor.*

This species was very common during the winter of 1902-3, feeding upon the salted gravel which we put out upon a small board for them. This preparation they ate greedily, seeming to be particularly fond of the salty flavor. They were joined at the salt-lick, as we termed it, by the white-winged crossbill, pine finch, goldfinch and redpoll. When eating they would turn the head, side downward, to enable them to catch up the particles in the bill. When licking the salt the tongue would be extended, until the base was out past the tip of the bill. The tongue would be protruded and withdrawn four times per second. They nested during the winter, as we now saw them collect tendrils from a vine at the house, and also observed them getting wool. The females only were collecting the material, their mates assisted by doing the looking on. In February young birds of this species came to the salt-lick, and still had the down adhering to the tips of their feathers,

WHITE-WINGED CROSSBILL. *Loxia leucoptera.*

This species may be termed a rare visitor in the vicinity of Fredericton, yet they are known to live in summer in the northern highlands of the province. Occasionally they come this way and at times are fairly common. This species, like the preceding one, feeds upon the fruits of spruce, black alder and birch, and like the former rears its young in winter. The wing-bars, of the first plumage of the young, are of a tan color. The song of the adult male is somewhat like that of the purple finch, and is poured forth while the bird is on the wing, either circling above and around his mate, or when floating in the air after the manner of the purple finch. Beautiful indeed are they as they display their colors, some clear sunny day, against a background of snow-laden conifers.

HOARY REDPOLL. *Acanthis hornmannii exilipes.*

This species has been taken at Peticodiac, in eastern New Brunswick, and is considered very rare.

COMMON REDPOLL. *Acanthis linaria.*

These birds are so erratic in their wanderings that one winter they may be abundant, next winter none, or come in autumn, pass on and not be seen here again until the following winter. Their favorite food is the fruits of the yellow birch and black alder. Weed and grass seeds are also eaten extensively. The writer has watched redpolls feeding upon seeds put out for them. They would feed for seven hours daily, and at the rate of fifty seeds per hour. This species should surely be befriended by the "Man with the hoe."

AMERICAN GOLDFINCH. *Spinus tristis.*

During the winter of 1900-1 goldfinches were observed here, February 15th, a very unusual occurrence, the usual time of arrival being in May. The greatest surprise came two years later when this species stayed all winter. The males were about the same color as the female's summer plumage, being entirely unlike the bright yellow plumage they wear in summer. The crown lacks the black cap, being the same color as the back. By the first of April the color of the plumage began to change. A few black feathers began to come in the crown and the body feathers began to show some yellow. By the middle of May nearly all were changed to the garb of summer. They fed throughout the winter upon the fruits of the yellow birch and cedar or arbor-vitæ.

PINE FINCH. *Spinus pinus.*

This species, like the redpoll, is so erratic in its movements that one never knows whether or not it will occur during the winter season, yet it is during the winter that we are most sure of its presence. They, like the goldfinch, feed upon the fruits of the yellow birch and arbor-vitæ When occasion demands they are pugnacious mites, as when at the salt-lick they would drive the crossbills away The yellow of the plumage is much more bright in spring than in autumn. When the male is paying his respects to the female of his choice, he displays his colors to good advant-

age, and as he performs in her presence with out-spread wings and tail, he is truly a beautiful little bird.

SNOW BUNTING. *Plectrophenax nivalis.*

This is the most easily recognized of any of our *Fringillidæ* of either summer or winter. Their food consists of seeds of weeds and grasses, of which they get an abundant supply in haystacks. It is alleged by some writers that snow buntings never perch on trees, but it is not uncommon to see them resting upon trees when not feeding, and I have observed them perched upon telegraph wires. Near our house is a spring stream that stays open all winter. One day four snow buntings were observed to come and bathe in the stream. They fluttered and splashed in the water as we often see birds do in summer, and then as if to dry their plumage they fluttered into the loose snow along the stream, working their way into the drifts until nearly buried. The whole performance occupied about five minutes. To one of us it would have been five minutes too long, as the temperature was several degrees below freezing and the snow was blowing along very freely.

TREE SPARROW. *Spizella monticola.*

This species is most common along river valley roads that are ringed with thickets of bushes. Seldom more than two or three are seen in one company. They are not common in winter in this section.

SLATE-COLORED JUNCO. *Junco hyemalis.*

A few individuals of this species are apt to remain with us throughout the winter. Their stay is probably regulated by the food supply. They evidently feed upon seeds taken off the ground or from low weeds.

SONG SPARROW. *Melospiza fasciata.*

It was another surprise to learn that this species also occasionally remains with us all winter. They are not rare along the southern coast in mild winters, but until the last two winters no record was known of their presence in the interior of the province. The last two winters some have stayed near here. They lived about a grist mill, and were supplied with food by the miller, who threw out foul seeds to them.

EXPERIMENT ILLUSTRATING THE CIRCULATION OF FLUIDS AND VITALITY IN PLANTS.

BY AN OTTAWA NATURALIST.

For some years back I have had a violent fancy for the common buttercup, (*Ranunculas acris*, L., introduced from Europe) which has spread so rapidly and in such numbers in our meadows, fields and orchards that it is one of the very commonest weeds in many portions of Canada to-day.

It is in point of construction one of the most perfect of our flowering plants. Look at its roots, its stem, its leaves, its hairs, its branches, petioles, flowers; the calyx, corolla, stamens, anthers, pistils, stigma, everything about it, and note the order, shape, relations and arrangements of these parts and their symmetry; keep this order in your mind as representing the type of a large and important family of plants, the family which stands at the head of all plant-life in point of perfection. There are many interesting experiments and studies which centre round this species.

The following experiment with a wilted sprig of the common buttercup, which measured nine inches in length, will serve to illustrate not only the great rapidity with which this species takes up moisture—water—through its marvelous system of canals in its internal construction, but also the vitality which it exhibits.

Taking this nine-inch specimen of the common buttercup which, by the bye, had remained for fully an hour and a half in a glass without water, it was observed that all the flowers and buds at the tops of the branches or petioles had wilted, and to such an extent that some were hanging with their receptacles facing the ground and for quite a distance back some of the petioles also were seen to be in an inverted position, at right angles to the horizontal.

It may be noted that the wound made to the plant, where it was severed, two or three inches from the root, as is the case in most plants had been partially closed up by dint of the constriction which took place in the shredded cells during the drying process. This phenomenon appears to indicate the provision made or contrivance used to retain as long as possible whatever moisture the

plant holds. A fresh and clean cut was then made by means of a sharp pair of scissors, a few millimetres above the old wound. It was twenty minutes after four in the afternoon when the plant was cut and placed in the glass with a little water at the bottom in order to test the absorption power and vitality in the specimen at hand.

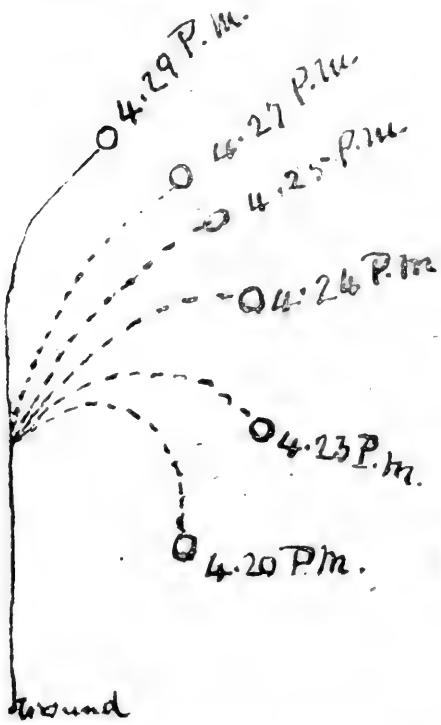
In less than one minute there was a clear evidence of a stiffening in the wilted petioles which formed decided curved lines or arches with the flowers and buds drooping or inclined at various angles.

At twenty-three minutes after the hour, there were clearer signs of a revival, and the buds and flowers had begun to raise their heads from the positions in which they severally were at the outset, and the topmost bud had changed its posit on fully 30°. Following the course pursued by this bud, at twenty-four minutes after four, it was fully 60° away from its first position. At twenty-five minutes after, this bud had made an arc of a circle subtending a right angle or 90°. At twenty-seven minutes after, making seven minutes after the experiment was begun, the topmost bud, and the part of the petiole supporting it showed no sign of wilting or prostration, but was gradually and effectively reaching the normal position in the fields, having raised itself an additional twenty-five or thirty degrees. At twenty-nine minutes after the hour, by far the longest part of the petiole was quite erect with the terminal bud very nearly vertical.

Thus it appears that in nine minutes of time only, the drooping and prostrate bud, which had been cut off from the natural and and steady supply of moisture for its support, after the plant had been immersed, at its wound, in water, had taken up sufficient moisture to restore and revive its branches, causing them to raise their heads, describing an arc subtending an angle of fully one hundred and fifty degrees.

When the experiment was first tried it was further noted that the first branches to give evidence of new life and vigor, were those nearer to the base or root. The first branch took the first supply of water, and the second branch took the next on, in regular order to the top. The topmost bud was the one selected for the experiment and calculations which proved most interesting. A sheet

of white paper was placed on the table behind the glass and as the flowers and buds rose, their precise location indicated on the paper. The different readings of the terminal bud are given in the accompanying diagram.



4.29. Sixth stage. Almost vertical.

4.27. Fifth stage. Nearing the vertical.

4.25. Fourth stage. One hundred and ten degrees change.

4.24. Third and intermediate stage.

4.23. Second and partially revived position.

4.20. First and prostrate position of bud.

I have no doubt that tables of relative speed giving the ratio of absorption of different plants and different parts of the same plant would be interesting data concerning the duration of life and vitality in plants. This would also form an exceedingly interesting pastime to anyone seeking a few minutes' pleasant recreation during the summer season.

It may be added that after removing the same specimen from the water and allowing it to droop again, it was ascertained, in two successive experiments that the vitality and power of absorption as exhibited in the degree of energy displayed in the buds and flowers re-assuming their natural and relative positions, diminished each time.

The last two experiments were made about an hour apart and the plant revived much less rapidly than in the first experiment,

which was then several hours after the plant was gathered in the fields, the plant exhibiting such difficulty in retaining its natural position that even after making a fresh cut there was but very little energy displayed on the part of the plant, and the experiment which for the time being proved so intensely interesting was abandoned.

A similar and collateral experiment was made at the same time with a field daisy (*Chrysanthemum leucanthemum*, L.) another introduced plant, a weed, but a beautful one, and it seemed to show that the process of absorption in this plant was much less rapid and effective than in the common buttercup.

It is a well recognised fact that the buttercup grows best in the dampest places in fields and meadows.

In the moist atmosphere and prevailing damp climate of the Maritime Provinces where the experiment was made, buttercups grow in what appears to be dry places, but in reality the air is so saturated with moisture, hygrometric readings being always high, that a plant, like the buttercup, requiring moisture, feels at home anywhere.

I would strongly recommend some of our your younger naturalists to try the experiment for themselves with the common buttercup or any other plant they may choose within their neighbourhood during the coming season.

McArras Brook, Antigonish County, N.S.

THE ANNALS OF THE FALL MIGRATION.

By A. B. KLUGH, Guelph, Ont.

The first intimation of the fall migration of 1904 was given by the bobolinks, our breeding birds disappearing on Aug. 3rd, and the first of the more northerly birds being seen on Aug. 12th. The cliff swallow was the next to depart, leaving on Aug. 14th. On Aug. 17th the yellow warbler, which had not been present in its usual numbers, took its departure, and the first black ducks were seen. On Aug. 19th, the warbler hosts from the north were ushered in by the appearance of the Tennessee, a single specimen being taken on that date. A small flock of mourning warblers, the males in full song, was noted on Aug 21st, and this was the last seen of this species, which is a scarce summer resident here. On Aug. 23rd a Cape May warbler was taken while flitting about in the tops of some white pines in the centre of a mixed bush, and proved to be an adult male. A flock of black-poll warblers was noted on Aug. 30th, and one of bay-breasted on Aug. 31st and on the latter date another Tennessee was taken. Sept. 4th saw the departure of the night-hawk and indigo bunting, and on Sept. 5th the last Wilson's thrush was observed. On Sept 6th, the wood thrush, whip-poor-will and wood pewee were noted for the last time, a flock of northern Parula warblers appeared, and a Philadelphia vireo was taken. Sept. 7th saw the last of the bobolink, barn swallow and tree swallow, and on Sept. 8th the kingbird departed. On Sept. 8th also the first flock of myrtles from the north arrived; previously to this I had only seen the families of those (three pairs) which had bred here. The Blackburnian warbler and northern Parula were seen for the last time and a Connecticut warbler taken on Sept 9th. Sept. 10th witnessed the departure of the waterthrush, and the first palm warbler and a flock of Tennessees (the last seen) were noted. On Sept. 12th the olive-backed thrush was seen, and on Sept. 13th the scarlet tanager and oven-bird departed and the ruby-crowned kinglet and brown creeper appeared. None of the last-named species bred in the vicinity this year though they usually do so. On Sept. 14th the last was seen of the green heron, a pair of which species bred in this locality. On Sept. 15th flocks of slate-colored juncos from

the north augmented the small numbers of that species which had been reared in the vicinity, the gray-cheeked thrush was noted and the red-winged blackbird seen for the last time. The 17th saw the last of the bay-breasted warbler, and chestnut-sided warbler, a few broad winged hawks were noted and another adult male Cape May warbler taken. This bird was in a flock consisting of chickadees, black-throated green warblers, myrtle warblers and chestnut-sided warblers. The crested flycatcher left on Sept. 18th and on Sept. 19th the American redstart was noted for the last time and the last Cape May also, an adult male, taken. The black-throated blue and palm warblers, Maryland yellow-throat, Savanna sparrow, cowbird and catbird were last noted on Sept. 20th, and the horned grebe and yellow-bellied sapsucker appeared. The last species is a scarce summer resident here, and none bred in the immediate vicinity this season Sept. 21st saw the departure of the cedar waxwing, magnolia warbler, and sharp-shinned hawk and the first fall American herring gulls were noted. On Sept. 22nd the last red-eyed vireo and black-and-white warbler were noted, also a flock of white-crowned sparrows and three white-winged scoters. The rusty blackbird, American pipit and ruddy duck appeared on the same date and a flock of surf scoters was seen. On Sept. 25th a red-tailed hawk, seen here only on migrations, was noted. The last ruby-throated hummingbird and American bittern were seen on Sept. 26th and the black-throated green warbler, black-poll warbler, blue-headed vireo and yellow-bellied sapsucker left on Sept. 27th On the same date the hermit thrush was first noted. Sept. 28th saw the departure of the phœbe and red-shouldered hawk ; an American osprey was noted on the same date, and on Sept. 30th the last was seen of the Nashville warbler, an abundant migrant and scarce breeder in this locality. On Oct. 1st the first redhead was noted. On Oct. 3rd the house wren disappeared and the only green-winged teal seen this fall were noted. On Oct. 11th the last meadowlark was seen and on Oct. 13th the last flickers and swamp sparrows. Oct. 14th saw the last of the towhee, chipping sparrow, purple finch, hermit thrush and myrtle warbler, and on Oct. 15th a pigeon hawk was seen. On Oct. 16th the winter wren disappeared and on Oct.

20th the last kingfishers, rusty blackbirds, white-throated sparrows, song sparrows, vesper sparrows and bluebirds were seen. On the same date the tree sparrow appeared. Oct. 28th saw the last of the ruby-crowned ringlet and the first for this fall of the American scaup duck. On the same date two flocks of fox sparrows were noted. On Oct. 31st the black duck and redhead were seen for the last time, the red-breasted merganser and bufflehead appeared, a pair of hooded mergansers, and three Canadian jays were noted. On Nov. 1st a flock of pine siskins were noted and the last American robin seen. On Nov. 3rd the last was seen of the mourning dove, a mallard and two American mergansers were noted, and the northern shrike appeared. Nov. 6th saw the last of the marsh hawks and the first of the redpolls.

A SERIOUS MISUNDERSTANDING BETWEEN MY SQUIRREL AND ME.

By M. E.

My home has been aptly described as "a large bay-window, a wide verandah, and an over-hanging willow-tree, with a small house in the rear." I live in the small house in the rear; my squirrels live everywhere else. My family is even smaller than the house; the squirrels I have never been able to count; but a small neighbor, who visits in their family, tells me that he counted twelve, at one time, and saw two more directly after. I can boast of feeding four, under the willow-tree, one afternoon last summer. As a rule, however, there are only two; a small, shy one, and a great, fat, tame one They run up the willow-tree and out on a bough that overhangs the verandah roof and jump on my window ledge, hunting for nuts, which they seldom fail to find—now in one corner, now in another—where every day I hide them.

One day, when the window was left open, one of them came in, and finding the basket of nuts on top of the secretary, upset it all over the floor. Such a noise! Such a panic! No one will ever know who beat in that race, for I flew up and the squirrel flew out, and we both agreed to say nothing about it. He has charming manners when he chooses: but, like some other

persons, "when he is bad, he is horrid." If, for example, he catches the thin squirrel hunting for a nut, he just gives him a smart box on the ear and sends him about his business. If I remonstrate, he says that the other one is so small that he does not need much food, and that nuts, in particular, are apt to disagree with him and make him sick in the night. After that, of course, there is nothing more to be said. When I am in the room the squirrel never touches the nut-basket, but sits up and begs, curling his great tail over his head and pressing his small paws on his little white stomach, as much as to say:

"See, how much I love you!" or, "See, how hungry I am!" (For squirrel language is as easy to understand as any other, when once you have learned it.)

But, alas! and alas! there came a sad day when my squirrel and I had a quarrel. And thus it came about. There is no squirrel large enough to hold, inside of him, all the nuts he will take, even allowing for the worst kind of indigestion; accordingly, being of a thrifty turn, he buries the nuts, one at a time—each, I think, in a hole of its own, covering it neatly so that no one would dream of there being anything hidden.

On the day of which I am speaking, my squirrel, being full to bursting, buried nut after nut, taking each one delicately from my hand, balancing himself the while with his sharp claws curled around my fingers. At last, taking a nut (and rolling it over and over in his mouth, after the manner of squirrels), instead of running down the willow-tree, he went to the end of the window-ledge and laid the nut down in the grooves made for the window. There he scratched and clawed, and burrowed and patted until he had settled that nut; then, turned again and begged for more. I gave him another, which he carried down the tree as usual. In a moment I saw him on his way back, and, without thinking, I picked up the nut that he had with such industry buried in the groove. He sat upon his hind legs, curled his tail at ease, clasped my fingers in his claws and opened his mouth for the nut. Suddenly, he stopped—reared himself to his full height, threw back his head and looked me square in the face.

"Do you mean to tell me," he began, then sniffed at the nut.

"Impossible!" I heard him exclaim under his breath.

He dropped down and walked straight to the spot where he had buried his nut. He sniffed, he snuffed, he scratched, he clawed, he burrowed. The nut was gone! He came back to me, raised himself once again by my fingers and, to cover all possibility of mistake, took one long, last smell.

"How did you *dare* to touch that nut?" he asked: "It was not *your* nut."

With that he left me and—the nut; and I heard him say, as he crept thoughtfully down the tree:

"Schopenhauer was right, after all, when he said that 'Women do not understand the first principles of honor and justice. . . . . Nothing should be left to their control: neither children, nor houses, nor lands, nor money,' nor, above all things —*Nuts!*"

Cambridge, Mass., U.S., Nov. 1, 1904.

ADDENDUM.

One of the charming features of Cambridge, Mass., where the writer of the above interesting note lives, is the number and tameness of the beautiful Gray Squirrels, which being protected and fed by kind lovers of nature, run everywhere through the large gardens and lawns, and may frequently be seen and approached, within a few feet, even on the roads and sidewalks. This shows how quickly wild animals will make friends and live with men, as soon as the latter will restrain their savage instincts of wanting to kill everything smaller than themselves or that they are not afraid of, or when they are compelled by law to act as if they were civilized Christian beings. The time is now coming near when we may hope to see our streets brightened with flocks of beautiful Pine Grosbeaks. It would be well for all members of our Club to make a point, whenever opportunity occurs, of trying to put a stop to the senseless destruction of these by thoughtless boys, who, owing to the confiding nature of these gentle birds, can catch them without trouble when feeding on the scanty food provided by the mountain ashes along our streets.

J. F.

CORRESPONDENCE.

METLAKATLAH, B.C., Nov. 5th, 1904.

The Editor OTTAWA NATURALIST.

DEAR SIR,—Enclosed I send you an extract from a letter from Mr. Rathbun, Assistant Secretary of the Smithsonian Institution, in charge of the U. S. National Museum, giving the name of some smallfish sent from this locality. It occurs to me that the identifications contained therein may be of interest to some of the readers of the OTTAWA NATURALIST.

Yours truly,

(Signed) J. H. KEEN.

"The specimens which you transmitted to the National Museum, have been received and examined by one of our ichthyologists, who informs me that they are stickleba ks representing the species *Gasterosteus williamsoni microcephalus*. This species was described by Dr. Charles Girard in the Proceedings of the Academy of Natural Sciences, Philadelphia in 1854. The specimens which Dr. Girard studied were obtained in Four Creek, a tributary of Tule (Tulare) Lake, San Joaquin Valley, California, by Dr. A. L. Heermann, a naturalist who accompanied the surveying party of the Pacific Railroad route. The range of this particular species of stickleback is along the west coast of America from Lower California to Alaska. It is found in lakes and streams and is generally abundant.

"Sticklebacks of various species are found throughout the northern hemisphere. They are noted for their pugnacity and are interesting for their nest-building habits, a full account of which will be found in Standard Natural History, Volume III, published by S. E. Cassino Company, of Boston, Massachusetts, in 1885.

"With the fishes were found some leeches which have been identified by Dr J. Percy Moore, of the University of Pennsylvania, Philadelphia, as representing the species *Hæmopis lateralis* (Say)."

THE OTTAWA FIELD-NATURALISTS' CLUB.

PROGRAMME OF WINTER SOIRÉES, 1904-5.

1904.

Dec. 16.—Address, by Principal J. F. White, of the Normal School.

The President's Address.

Animal Life in the Hudson Bay region. Andrew Halkett.

The Soirée Committee considered it advisable to substitute for the formal lectures of the past a number of short popular talks each evening on the various branches of the Club's work, and the gentlemen named below have consented to speak on the subjects specified. More detailed particulars will be given through the public press before each meeting. On Zoology descriptions will be given of the life history, habits, etc., of the polar bear, fur seal, whales, star-fish, frogs, sea-urchins and other animals. The characteristic features of the Geology of the Ottawa district will be dealt with and special attention will be given to structural features as well as the history of the abundant fauna found in the rocks and clays. Ornithology, Entomology and Botany will be treated in a similar manner, each speaker giving the results of his personal observations.

1905.

Jan. 17.—*Mammals.* Messrs. Prince, Low, J. M. Macoun and Ballantyne.

Jan. 31.—*Geology.* Messrs. Ells, Ami, Chalmers, Dowling and Keele.

Report of the Geological Branch.

Feb. 14.—*Entomology.* Messrs. Fletcher, Harrington, Gibson and Young.

Report ot the Entomological Branch.

Feb. 28.—*Zoology.* Messrs. Prince, John Macoun, Halkett and Odell.

Report of the Zoological Branch.

Mar. 14.—*Ornithology.* Messrs. Kingston, E. F. G. White, Eifrig and W. T. Macoun.

Report of the Ornithological Branch.

Mar. 21.—**Annual Meeting.**

Ferns of the Ottawa District. T. E. Clarke.

April 11.—*Botany.* Messrs. Sinclair, John Macoun, Fletcher, Campbell and Attwood.

Report of the Botanical Branch.

All the meetings will be held in the Normal School, at 8 o'clock p.m., sharp.

President, W. T. MACOUN.

Treasurer, A. GIBSON. (Central Experimental Farm.)

Secretary, T. E. CLARKE. (470 O'Connor st.)

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A LANDSLIDE ON THE LIEVRE RIVER.

By ALFRED ERNEST BARLOW.

(Published by permission of the Acting-Director of the Geological Survey of Canada.)

The people of the city of Ottawa and surrounding country were shocked and alarmed by reading in the early morning paper of Monday, October 12th, 1903, that a landslide of very large proportions had occurred in the vicinity of Poupore Post Office on the Lièvre river, nearly twelve miles north of the town of Buckingham in the Province of Quebec. Many of the details of this catastrophe, as gleaned from the newspaper reports, are no doubt well remembered by most of those who will read this article, which is written in order to describe with greater technicality than is usual in a newspaper contribution, some of the more salient features, furnishing what are considered the main reasons determining and even favoring this wholesale movement of mother earth. The accompanying reproductions, from actual photographs will serve, in a measure, to illustrate the general appearance, two days after the landslide occurred, of the portion affected. An inspection of these will, it is believed, convey a much more adequate idea than is possible by mere words of the great havoc and ruin wrought to what had previously been the scene of peaceful and happy homesteads, whose inmates harbored no suspicion of disaster. The first intelligence reaching Ottawa that such a calamity had overtaken this peaceful community, in the grey dawn of that Sunday morning, was conveyed in a telephone message sent to Dr. Henry M. Ami, by the Rev. William Patterson of Buckingham. This news was received about 10 o'clock, five hours after the movement

had ceased. All the first reports were, of course, of a rather vague and contradictory character, but ignorance of the details of the situation did not prevent the spreading of greatly exaggerated statements, not only in regard to the extent of the damage inflicted, but also as to the consequences that were sure to follow. It was greatly feared, and firmly believed by many, that the release of the dammed-up waters threatened the safety not only of all the residents in the Lièvre valley below the slide, but also of the town of Buckingham. The urgent necessity for more accurate and detailed information was fully appreciated by Dr. Whiteaves, who, in Dr. Bell's absence, was acting as Director of the Geological Survey. Dr. R. W. Ells, who had previously examined and reported upon the geology of the district in which the slide had occurred, was given charge of the examination, while Mr. LeRoy and the writer accompanied him, to make any necessary surveys and secure such photographs as would fully illustrate the occurrence. The Summary Report of the Geological Survey Department for 1903 contained Dr. Ells' official account of the landslide, accompanied by a small plan showing the position and extent of the area affected. This map, on a scale of twelve chains to one inch, was prepared by Joseph Keele from surveys made by James White, O. E. LeRoy and the writer.

Like the proverbial policeman, the Government geologists were early on the scene after the catastrophe, leaving Ottawa by the evening train of Monday, October 12th, for Buckingham. During the journey, all sorts of rumors were afloat as to the danger threatening the mills, and even the town of Buckingham itself, by the backing-up of the waters caused by the filling up of the channel of the river by the debris from the landslide. On our arrival at Buckingham, however, we were reassured by the report that the water had surmounted these clay barriers, about four o'clock that afternoon, and was flowing over this uneven surface of accumulated material, by a series of small channels, which would certainly deepen during the night. We, therefore, retired to rest at the hotel, with a sense of tolerable security, feeling that the crisis had passed. The morning broke bright and clear and we made an early start for the scene, driving up the road on the west side of

the river as far as Brazeau's house. Leaving our horses there, we immediately began our examination, walking around and across the whole area, taking such photographs as would illustrate fully the phenomena witnessed and making such surveys as were necessary to show the position and extent of the area affected.

This remarkable and extensive landslide occurred on the southwest bank of the Lièvre River, in the early morning of Sunday, October 11th, 1903. The first disturbance was felt at 4.45, while it was yet dusk, and with the exception of some minor disturbances, the whole movement was completed by 5 o'clock. It was not attended by any noise, except that produced by the straining and cracking of the timbers of the various barns and structures affected. The simultaneous transportation of such a large amount of material into the bed of the stream at once completely choked it up, forcing the water to either side, thus flooding the banks, the water reaching to the lower windows of the farm houses. (Plate III.) In all, about 100 acres were affected by the movement, and the larger portions of three farms were rendered practically useless, at least for some time to come. Time will efface many of the inequalities, but the area will never present the same beautiful, sloping farm-land which was looked upon as one of the most desirable agricultural sites in the whole of the Lièvre valley. The excavation caused by the landslide, for most of it is from 25 to 30 feet below the original level, comprises portions of lots 25 and 26, con. XI, of the township of Buckingham, and lots 7 and 8, con. I, of the township of Portland East. The farms which suffered belonged to Alexandre Clèment, Maurice Brazeau and Duncan McMillan. Only one residence, that belonging to Clèment, was moved. This house, originally situated about 100 feet south of the road which here formed the boundary between the two townships (Buckingham and Portland East), and thus within the former township, was moved about 100 feet north of the road into the township of Portland East, while, at the same time, the area of land, immediately surrounding the house, was lowered *en bloc* about 20 feet. The disturbed area has a somewhat irregular outline, extending back a distance of about 700 yards from the river to the base of the hills of gneiss and granite, which here form the southeastern edge of

the valley. (Plate V, Fig. 1.) Along the river front, the length of the landslide was nearly 600 yards, but near its eastern end a small wooded knoll rises above the general level to a height of about 35 feet, which must be either underlain by rock or made up of a very homogeneous and impervious clay. This small hill, forming a rudely triangular buttress, with the apex towards the land and a base measuring about 100 yards along the river, remained unaffected by the movement. The slide thus divided into two parts, by far the larger amount of material reaching the river to the west of the small hill already mentioned. The greatest excavation is as usual along the base of the hill and at the western or upper end of the slip, while the crevasse, marking the eastern limit has been concealed, to a large extent, by the piling up of material into a series of hills, rising from 12 to 30 feet above the clay plain, and made up of loose material derived from the rest of the area. This crevasse, which originally marked the eastern limit of the slip, ran with a gentle curve immediately to the west of Brazeau's residence, the movement overturning his barns and some outhouses, although the residence, carpenter-shop and milk-house were not affected in the general commotion. There were likewise no cross fractures produced in the area on which the house stood, for the water in the well, which is about 12 feet deep, showed no signs of any disturbance. The western limit passed close to the east of Duncan McMillan's house and outbuildings, some of the latter being on the verge of the crack thus produced, while the southeastern edge reached to the slope of the hills of gneiss and granite which here mark the limits of the valley. The Government dam, which was completed some years ago, was pushed about 100 yards from its original position and now points up instead of across the stream ; while the locks, constructed at great expense, were filled almost completely with the debris from the slide. A barn, full of hay, situated near the middle of lot 7, con. I of Portland was carried down the stream, on a huge block of clay, and now occupies an island in the river, nearly half a mile from its original location. Happily not a single life was lost, though, in the circumstances, it seems miraculous that all escaped. About ten head of cattle were killed and some of these were completely entombed by the overturned clay. Only one man was an

eye witness of the whole of the scene, and at the time of our visit it was believed that his mind was permanently unbalanced by what he saw. Alexandre Clèment, standing on the threshold of his front door, saw the slow and deliberate differential movement of the huge blocks of land, which tilted his barns, smashing many of the timbers and boards in the commotion. (Plate V, Fig. 2.) On the opposite side of a large crevasse, which he saw open slowly almost at his feet, a huge block of land appeared to rise to a height of perhaps twenty or more feet. Subsequent examination shows this to have been an optical illusion, for in reality, this land which appeared to rise, remained practically stationary, while, on the other hand, the portion on which his house rested, slowly sank from 20 to 30 feet below its original level. In addition, the whole farm and adjoining district seemed to him to be slowly, but surely, moving towards the river and, after what appeared an eternity, the whole commotion subsided. So gradual and uniform was the motion in the vicinity of Clèment's house, that a glass of water, which was filled and standing on the ledge of the front window, was still in the same condition, when the landslide was complete. The water in the well, which was about 12 feet deep also remained at its normal level, showing that no crack was formed in this part of the block of land.

Such landslides are by no means of infrequent occurrence along the banks of rivers which flow through similar clay flats, but, for the most part, only small areas, in the more immediate vicinity of the river, are affected. Several landslides have, however, occurred, within the last sixty-five years, along some of the tributaries of the St. Lawrence river, which were of such magnitude, and attended with such direful results, as to warrant special examinations being made, with a view not only of determining the extent and nature of the damage inflicted, but also, if possible, to reach a definite conclusion as to the causes which bring about such wholesale and profound disturbance of areas, hitherto considered more than ordinarily secure and solid.

The first landslide in the Province of Quebec of which we have any record occurred on the Maskinongé river in 1840,

and was described, in some detail, by Sir William Logan.* The point at which the landslip occurred is nine miles from the granite hills, and where the river is 10—20 yards wide and changes its direction from south to west for 700 yards. The movement commenced about 8 o'clock on the morning of the 4th April, 1840, when the snow was still on the ground. The marly clay first detached was about 200 yards in breadth, and 700 yards in length; it was followed at intervals of a few minutes by four other movements. The whole of the area thus affected amounted to about 84 acres, and the total length was 1,300 yards. The breadth varied, the narrowest part being nearest to the river and the widest, equalling 600 yards, a considerable way from it. The moving mass first crossed the stream and then splitting against the opposite bank, where it averaged a thickness of 75 feet, one-half turned up the valley for about three-quarters of a mile and the other half down it for an equal distance, forming a dam half a league in extent. The whole operation was completed in about three hours. No lives were lost, but two farms were destroyed, while cattle and other live stock perished with the falling buildings.

The St Albans landslip, described by Mgr. Laflamme† of Laval University, occurred on the 27th of April, 1894, on the west bank of the Ste. Anne de la Pérade, about four miles above the village of St. Albans, or seven miles distant from the Rivière Blanche. Here the surface deposits, made up of Leda clay and Saxicava sand, slid down into the valley of the river for the space of three miles and a half. The landslip was in three parts, the first movement being at the northern end where it was about ten feet deep. This was followed after some hours by another which took place immediately to the south and finally a third descended just below the second, leaving a pit 175 feet deep. The average depth of the whole chasm was not less than 100 feet below the general surface of the ground and its width about a mile. The mass of material thrown into the valley of the Ste. Anne permanently changed the course of the river. The Rivière Blanche

* Proc. Geol. Soc. Lon., Vol. III, 1838-1842, pp. 767-769.

† Trans. Roy. Soc. Can., Vol. XII., 1894, Sect. IV., pp. 63-70.

landslip described by Dr. Chalmers was closely simliar to that of the Maskinongé river described by Logan. It took place on the east bank of the Blanche, a tributary of the Ste. Anne de la Pérade at St. Thuribe, about 3 miles north of St. Casimir village. The chasm remaining from this landslip is also irregularly oblong in shape, like that of the Maskinongé valley with the narrowest end towards the Rivière Blanche. At this point the breaking down of the beds began and through this opening the whole of the material of the landslip was discharged. The length of the pit, east and west, is about 1,050 yards; extreme width 600 yards; maximum depth about 28 feet; total area 86 acres. The descent of the bottom throughout its whole length is approximately about 27 feet or about 10 inches to the hundred feet, and the gradient is comparatively uniform from the eastern end to the present bottom of the river. Indications of a movement of the clays was first seen on the evening of the 6th of May, 1898, in a small hollow in the bank, down which a trickling stream ran; but no attention was paid to it. About 5 o'clock on the morning of the 7th, the breaking away of the clay beds began where some slipping had been noticed on the previous evening. The softer material flowed out from beneath, while the upper and more coherent clay split off in vertical sheets and columns which were borne away in the sliding, surging mass. This continued for upwards of three hours, when the transporting power seemed to have spent itself, and the great masses of clay, which had become detached from the walls of the chasm, were stranded in its bottom and at the time of examination were seen standing in various positions, some of them resembling cones, pyramids, etc.‡

The causes operating in the production of all these landslips may be summarized under two general headings :—

1. The presence of silty, sandy, or gravelly portions or layers in these stratified clays, renders these and some of the adjacent portions capable of absorbing and retaining a large amount of water. According to Mr. R. A. A. Johnston, of the Geological Survey, who made an analysis of the clays obtained from the

‡Ann. Rep. Geol. Surv. Can., Vol. XI., 1898. Part J, pp. 65-69.

Rivière Blanche landslip, they contained, when saturated, from 22 to 25 per cent. of their own weight of water.

2. Increased or unusual precipitation, which furnishes the great excess of water necessary to produce that condition of supersaturation of certain portions of the clay which eventually brings about unstable equilibrium of the beds. Thus, certain layers or portions of the clay are in a semi-liquid condition, and examination of the Lièvre occurrence shows a considerable portion of the clay to have about the same consistency as ordinary thin porridge. The extra weight of the overlying material, due to the unusually large amount of contained water, results in the displacement of those portions or blocks of land which are underlaid by the supersaturated or liquid clay. Movement once begun gathers force and quickly extends the area affected, and the existence of even a very gentle gradient imparts an irresistible movement towards the lower ground in the vicinity of the river.

The flats which border the Lièvre river in the neighborhood of the recent landslip are principally made up of very thick and uniform beds of a stiff, impervious bluish-gray clay, with small and subordinate layers of silty, sandy or gravelly material. This drift material forms a plain, which, with very occasional minor depressions, occupied by small marshes or creeks, extends to the base of the rocky hills. Between this clay and the solid rock beneath, along the base of the hills, there generally intervenes a considerable layer composed of boulders or coarse gravel. Most of the surface drainage from the rocky hills flows out along the top of this plain, reaching the river through one or two small brooks. A large proportion, however, of this surface water flows downward through the coarse gravel and boulders, finding its way into the various sandy or silty layers and thus feeding the wells which are located on one or other of these layers. The introduction of this water serves to produce the necessary degree of saturation. During extreme wet seasons, like the summer of 1903, the amount of water thus flowing into and along these permeable layers must be very large, and with long-continued and unusual precipitation the saturated clay is being constantly increased, until the limit is reached and the necessary conditions of unstable equilibrium are produced. As a result it occasionaliy

happens that the stiff and more coherent masses of clay are broken down and mix with the softer material, the whole mass of clay, sand and mud being tumultuously and irresistibly moved forward and downward into the basin of the river.

According to Mr. R. F. Stupart, Director of the Meteorological Office, Toronto, (see accompanying table,) the average rainfall at Ottawa for the five months commencing June and ending in October, for the past nineteen years, was 14.62 inches. The rainfall during the summer of 1903 for a similar period was 19 44 inches. This abnormal precipitation doubtless contributed in no small measure to the catastrophe.

Sir William Logan, commenting on the cause of the Maskinongé landslip, was of the opinion that it was induced by "pressure on an inclined plane assisted by water;" and though he was not able to determine the nature of the subsoil, he believed, from a survey of the surrounding country, that it consists of Silurian limestone, the dip of which is, where visible, in the direction of the river.

At no point, so far as our examinations extended, did the Lièvre landslide reach the underlying solid rock surface, the gliding plane being in every case composed of the underlying impervious clay or hard-pan. This very smooth and striated surface, as shown in the accompanying illustration (Plate IV), was visible at several points along the base of the hills, as also on the western side of the wooded knolls situated near the river and which were not affected by the movement.

The motion must have been primarily determined by the presence of rather contiguous and extensive sheets of the supersaturated or semi-liquid clay; for it is obvious that no very steep gradient existed throughout the entire distance. In fact, the observations made seemed to warrant the belief, that the gliding plane was only steep in very close proximity to the rocky hills, while a short distance away, it was more or less undulating with only a gentle pitch outwards and downwards to the river. The original level of the plain, at this point, averages about 25 feet above the river, while the river itself is only about 20 feet in depth. Much of the debris which eventually reached the river was material once situated about 20 feet below the original

surface and it was the sudden removal of this underlying material which produced the caving-in of the surface layers, at the same time moving them a considerable distance forward. Most of the trees, except in the vicinity of certain cracks, remained in their original upright position. The motion was spasmodic or halting, owing, doubtless, to the obstruction on the part of the harder and more impervious portions of the clay, so that a number of anticlinal and synclinal folds were produced, while much of the disturbed material showed very excellent samples of block faulting. In many places, owing to this retardation in movement, huge blocks of the hard and impervious clay were shoved up almost on edge through the overlying loam or soil at the surface.

As an immediate result of this landslide, the water of the Lièvre river below was so filled with the finely divided clay as to render it unsuitable for drinking or even for washing purposes. To such an extent indeed was the material held in suspension that even at Montreal, over 100 miles from the scene, the water was quite thick and turbid. The mills at Buckingham were obliged to close down for a considerable length of time as the dirty water clogged the machinery. All the water required for cooking or drinking was obtained from the few wells remaining in the town, that derived from the waterworks being unfit for use.

TABLE showing Rain and Snow Fall at Ottawa during years 1897 to 1903, inclusive.

Compiled under the direction of R. F. Stupart, Meterological Office, Toronto.

	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total for Year.
		in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
RAIN.	1897	0.38	0.35	1.51	1.62	3.31	3.03	5.21	3.40	0 45	0.69	2.19	1.84	23.98
	1898	0.66	0.90	2.13	0.55	2.46	2.24	2.87	3.22	3.48	5.68	0.36	0.41	24.96
	1899	0.75	0.29	1.09	1.03	5.50	2.37	7.62	0.44	4.93	2.47	1.74	2.24	30.47
	1900	0.20	1.20	0.20	0 76	3.00	3.21	5.99	2.72	3.56	1.45	2.40	R	24.69
	1901	0.20	0.00	0.90	2.99	3 91	3.76	3.18	3.23	1.91	1.45	0.40	2.13	24.06
	1902	0.81	0.40	3.14	2.74	1.82	4 29	5.98	1.67	1.23	3.30	1.26	0 80	27.44
	1903	0.96	1 60	1.32	0.85	0.12	6.55	3.24	4.00	2.14	3.51	0.39	R	24.68
SNOW.	1897	15.5	15.7	28.6	2.0	....	....	....	....	....	....	5 8	22.9	90.5
	1898	26.4	34.3	*	2.0	....	....	....	....	....	....	10.7	27.2	100.6
	899	14.1	5.8	45.9	*	....	....	....	....	....	....	*	10.0	75 8
	1900	25.4	14.0	35.0	(10 in. snow = 1 in. water)							11.0	16.0	101.4
	1901	31.1	8.0	13.0	*	....	....	....	....	....	*	18.5	21.9	92.5
	1902	30.9	24.3	3 3	....	....	....	....	....	....	....	2.0	24.5	85.0
	1903	18.6	26.5	0.3	1.0	....	....	....	....	....	R	3.0	18.8	68.2
	AVERAGE PRECIPITATION FOR 19 YEARS.													
RAIN AND SNOW.		3.00	2.62	2.89	1.86	2.74	2.95	3.46	3.04	2.66	2.51	2.53	2.96	

R represents only traces of rain.

* ,, ,, snow.

REVIEW.

THE NATURE STUDY REVIEW. Published at 525 West 120th St., New York City, U.S.A. Bi-monthly. Subscription $1 per annum.

"Devoted to all phases of Nature Study in elementary schools," is the comprehensive sub-title of this new periodical, the first number of which has just been issued. In the introduction the editors say that their "plans are based upon an interpretation of Nature Study in its literal and widest sense as including all phases, physical as well as biological, of studies of natural objects and processes in elementary schools." This interpretation of Nature Study includes all the "natural science" studies of the lower grades in the public schools, and it is with Nature Study in relation to elementary school work that THE REVIEW will chiefly deal.

The Nature Study articles published in THE OTTAWA NATURALIST cover much the same field, but important features of THE NATURE STUDY REVIEW are its Book Reviews, Notes on Recent Literature, and Guide to Periodical Literature. These departments will keep both student and teacher posted as to the literature of a subject in which they must perforce interest themselves. The chief Articles in the January number are "Nature Study and Natural Science—a Symposium," "Physical Nature Study," "Nature Study and Elementary Agriculture in Canada," "Some recent criticisms of Nature Study," "Agriculture in Southern Schools,' "School Gardens," and "Ant Nests in the Schoolroom." These titles indicate the scope of THE REVIEW, sample copies of which may be obtained by sending six cents in stamps to the publishers.

The Club's soirée season opened Dec. 16th, when Mr. Andrew Halkett lectured on "Animal Life in the Hudson Bay Region." Jan. 17th, Prof. Prince, Mr. A. P. Low and Mr. J. M. Macoun talked to the members of the Club on Mammals. Reports of these meetings will be published in the next number of THE NATURALIST.

NATURE STUDY—No. XX.

NATURE STUDY AT THE MACDONALD INSTITUTE.

By D. J. DOYLE, Guelph, Ont.

Perhaps no more important educational problem has been attempted in recent years than that which was presented in the Nature Study department of the Macdonald Institute at Guelph to the late Dr. W. H. Muldrew, whose unexpected death on Oct. 7th, 1904, at the very beginning of the first term in which a regular Nature Study class had been enrolled, has proved a serious loss not only to the Macdonald Institute, but to educational progress generally in Canada. Prof. Lochhead, who next assumed charge of the Nature Study department, setting to work with a definite aim, has ably carried forward the work of his predecessor.

Regarding the psychological value of the new study in the development of child intellect, there is, I think, a general measure of unanimity among educational workers. It is when we turn from this phase of the question to the necessity of the teacher's knowledge of Nature and the simpler elements of Science extending far beyond that of the child, in order that the efforts of the latter may be best stimulated and directed, that the first note of discord arises ; and we find our educators quietly taking sides. On the one hand are arrayed those who assert that a knowledge of child-nature is by all odds the primary requisite for the equipment of the teacher of Nature Study. On the other—and here are embattled the staff of the Macdonald Institute—stand those who believe that a knowledge of child-nature, while an element of very great importance in itself, must still yield precedence to a knowledge of that other nature which is to be met with in the out-of-doors, and upon the regular working of whose laws the welfare of the human race inevitably depends.

Imbued with this conviction, the staff early directed their efforts towards placing the students as much as possible in direct contact with Nature, and particularly with those objects and phenomena which lay readiest to hand. This was secured in two ways, (1) by field excursions, (2) by laboratory work and lectures. The field work proved in many ways perhaps the most in-

structive feature of the work at the Institute. Here for the first time were the students placed face to face with Nature. To the keen observer how much do the field and wood reveal on an autumn day? How seriously is he handicapped whose knowledge, brought to the interpretation of Nature, has been limited to the casual observances of a few leisure hours! The distant gleam of white on the alder bough, the flitting glimpse of a grey wing in the bush, the patch of green on the old beech trunk pass unheeded by under the eye of the nature amateur. But when under the direction of a skilful naturalist, the white upon the alder has been examined and reveals itself as a mass of fuzzy living aphids; when the peculiar squeaky bird-call has been sounded and the grey wing resolves into a nervous, shy, little ruby-crowned kinglet; when the patch of grey on the beech has revealed one of the many lichens, and one's laboratory practice tells him that this little mass of grey represents a life far down in the scale of plant development, then the fields and woods take on an added interest, and the simple and obscure claim equal rank with the gaudy and the beautiful.

The best methods of correlating the new Nature work with the old subjects on the curriculum was a matter demanding particular attention. For an illustration of recent earth history it was shown that no better spot could be selected than a gravel pit. Here the pupils may examine the shape and nature of the gravel-stones, the resemblences or differences between these stones and the bed rock, the arrangement of the layers of gravel, the dip of these layers, etc., showing the action of water. Subsequent lessons may include observations of the surrounding country, evidence of the action of ice or water, changes in the beds of lakes and rivers, etc., from which the pupils may deduce much of the past history of the locality. In history, a beginning may be made in the life of the district, its trustees, its forms of government, the township council, leading men and women of the township, stories of early settlement, etc. In literature certainly, a knowledge of nature is necessary for an understanding of the passages to be studied. Let the pupils go out to the meadows and observe the bobolink there before taking up such a selection as Bryant's "Robert of Lincoln." Only in this way can they appreciate the

truth and structural adaptability of this little poem. In composition, descriptions of journeys in the fields and woods, of birds and trees and animals observed, may be found subjects on which the children will write interestingly and naturally. Taken altogether, Nature Study need not be considered a new subject, but rather as a vitalizer of the old.

Here also may properly be mentioned the lectures and field work in gardening conducted by Prof. Hutt, of the College staff. During a spring or summer term this work should be made to constitute one of the most important features of the course. But the nature of the weather this fall seriously interfered with the carrying out of any extensive field work. What was possible, however, was done. Following a series of lectures on the subject, advantage was taken of the first fine day to stake off, level, plant, and label a series of plots, each student having one in charge. The lateness of the season prevented the germination of the seeds, but this work was carried on within doors by means of germinating boxes and blotting pads, a series of drawings being made to illustrate the stages of development in the plants.

Roughly speaking, the work in the laboratory was divided into three parts: (1) an examination into the stages of plant evolution as revealed by the common algæ, fungi, lichens, mosses, ferns, etc., of the locality; (2) experiment in plant physiology, elementary physics, and organic chemistry; and (3) elementary entomology.

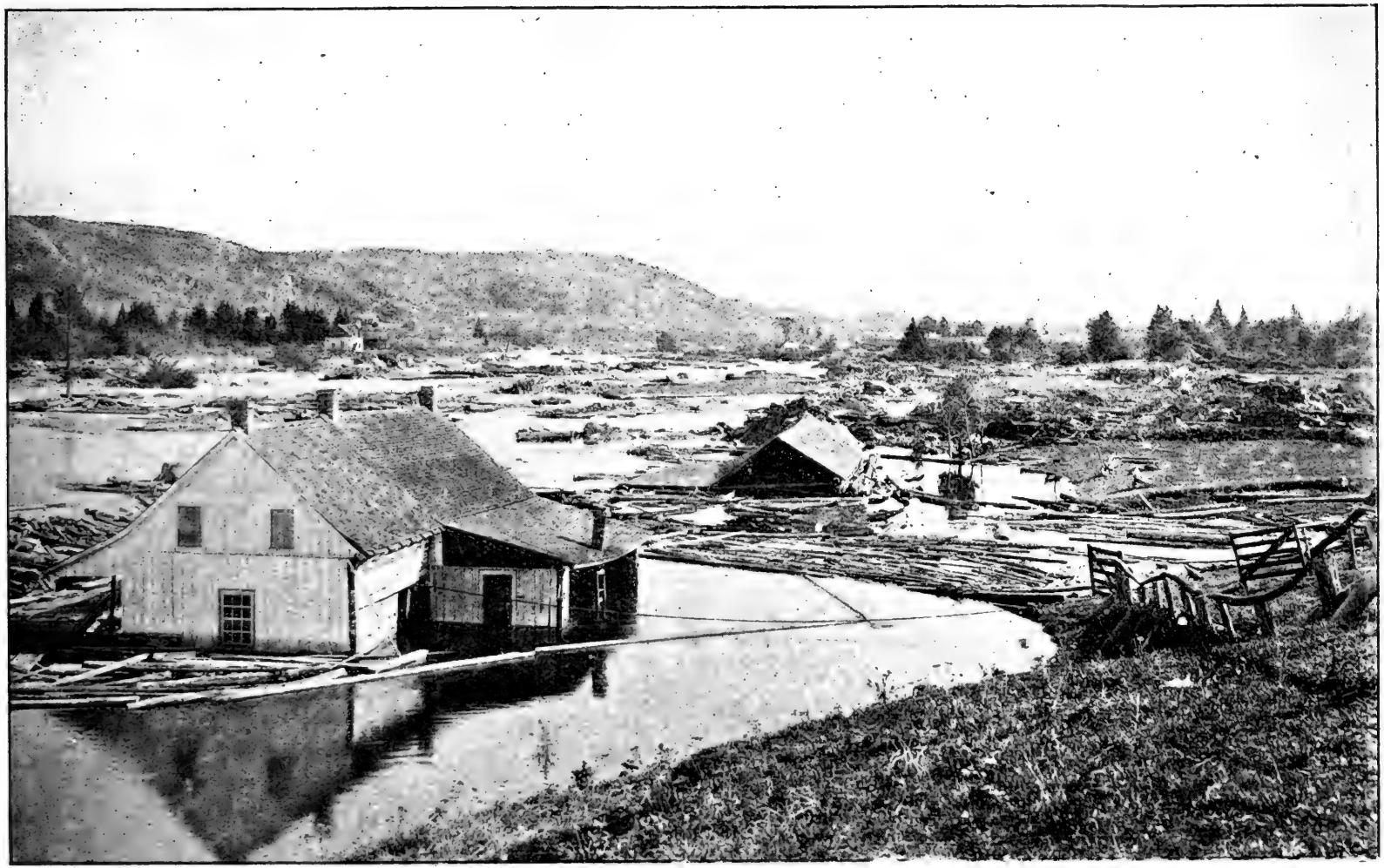
If to any subject, surely the old adage that "seeing is believing" is applicable to Nature Study. Here, if never before, the child must get rid of books and hearsay, and reach down to the very facts of Nature itself. The pictured object which some one else has seen and depicted, will not suffice here; much less the word description. The child must come in contact with the actual object and develop through his experiences with that. And yet, how much of the teaching of the past has practically been hearsay, those who have passed through our elementary and high schools within comparatively recent years can sadly testify

It was Plato, I believe, who instanced the position of a man who had grown to maturity in some dark place and then been brought suddenly forth to the light of day and the world of nature around him. He pictures the wonder of that man, his *realization* of the facts before him. He has not seen these things pictured in books and grown up with them. To him they are new, and real, and divine. In a somewhat similar position is the child who has grown up in personal contact with Nature. How does the crude sap in the soil rise in the stems of plants? The child knows it does rise, for he has seen the watery juice in the stems and leaves.

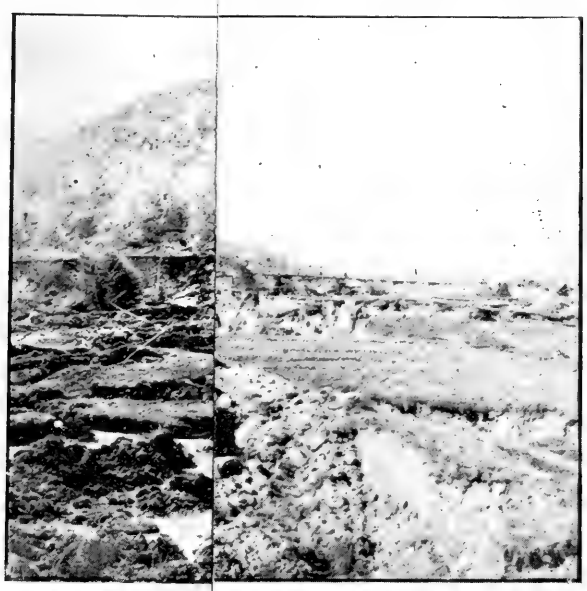
But how? Two simple laboratory experiments reveal the facts: (1) that given certain conditions, liquid will rise in a glass tube through an osmotic membrane, which may represent a root fibre, and (2) that colored liquid will rise in a cut stem placed with its end in the liquid, and further that, in rising, it follows certain, well defined passages. The child sees this before his eyes. It has become a real fact in his consciousness. He has had a new experience. And these are only a few of the many simple experiments by which a realization of the working of Nature may be brought home first hand to the pupil.

With younger pupils, no doubt these broad and pleasant stimuli which appeal to the æsthetic side of the child's nature must be largely depended upon for development of sense activity. But to the child whose years at school are limited, a practical knowledge of those features of Nature with which his life-work will be most closely connected is of many times the value. With this object in view, the attention of the class was directed towards the collection and study of weeds and weed seeds, and the rusts, smuts, and other parasitic growths which at times have proved so serious a menace to agricultural success. To this work were appended brief descriptions of the best methods of fighting these enemies of the farmer. The collection of specimens of injurious insects and their work, also placed the class in possession of much valuable information regarding another element of danger to the farmer's crop.

In the Manual Training department a successful attempt has been made at the correlation of Nature Study and woodwork, cardboard work, drawing, design, color work, and modelling. In the wood and cardboard work only such models have been selected as would prove of practical value in the Nature work, as, plant labels and garden stakes, spreading-boards, terraria, bird-houses, etc., in wood, and seed-boxes, etc., in cardboard. In drawing, no pencils were used, brushes taking their place. A beginning was made in blob work and moss drawing in ink. This was followed by color work, the construction of charts, drawing of objects in colors, and natural and conventional designing. Of this work perhaps the most important feature was the drawing of natural objects in colors. Anything—a bird, a butterfly, a twig—was selected and worked out with a brush in its natural colors. Prof. Evans, who has charge of the Manual Training department, advises the introduction of this work into even the lowest grades and its continuance throughout the School. In this way it is hoped we may be able to cut adrift from the conventional, expressionless drawing work of the past, and do something towards the development of those artistic instincts which have hitherto been left dormant in the child. Poets may be born, but artists must be developed.

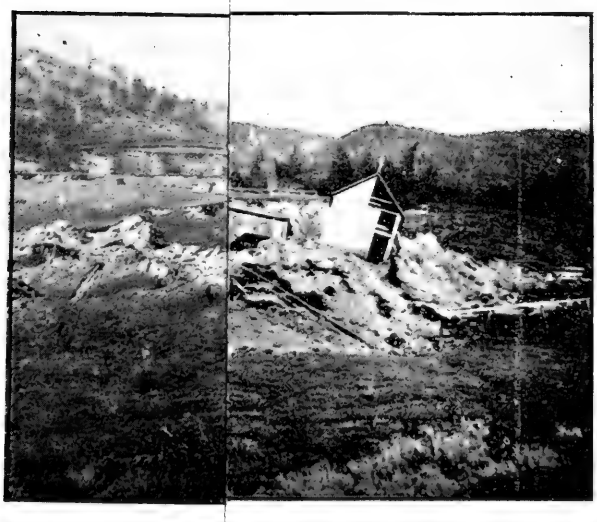


View looking down (east) Lièvre river from McMillan's house, showing submerged portion of the flat caused by



Vie took place.

PLATE V. FIG. 2.



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CANINE INTELLIGENCE.

By SIR JAMES GRANT.

THE JUDGE AND THE DOG.

What a peculiar animal the dog is! How full of instinct, in fact almost approaching common sense, or uncommon sense, if it might so be termed. There is so much in the very expression of his face, the cock of his ear, the grin of his mouth, the wag of his tail and the occasional oblique attitude of his body, all making up in a most unmistakable way, for the absence of speech, so often uttered by a bark. Is it any wonder the dog takes so important a place in almost every household? He is far more than ornamental, he is useful, and his characteristics, studied out, even in a moderate way, demonstrate beyond a doubt, how much there is in this type of the quadruped species. Now and then in this section of Canada we have a real dog show, and for variety and peculiarities of dogs, the wonder is, how so many strange dogs found their way so near the north pole. In the discharge of my professional duties, I have often been amazed at the sense exhibited by dogs, particularly in the way of observing the sick of the household. Recently, a little Scotch terrier, one of the small, well cut and shaggy-haired kind,—the little fellow that looks under his long hairy eyebrows, as if he knew more than any other of his class—attracted my attention. This little canine held his own position in the household with great coolness and dignity. When any stranger called, he generally observed the surroundings in his own peculiar way, and just in accordance with his impressions, he would growl as if not perfectly satisfied, or take a good look and walk off quickly to his usual quarters, fully satisfied

nothing in particular would happen. The proprietor of the house, a judge of high standing, had been ill for some months, during all of which time the little terrier was a great comfort and source of pleasure. Wherever his master changed his place there also the little dog was to be found. He noted every action, and no matter how many called, or what the company was, behind, or under his seat or on the mat near his feet, the little canine proved beyond a doubt his faithful character, and almost actual knowledge that his master was not in his usual health and spirits. For some time the physician had not paid much attention to the little canine, who apparently was not to be passed over in a casual manner. One day, when making the usual call, the small dog was actually on the sidewalk evidently on the look-out for the particular friend of his master. No sooner had the physician arrived than the dog began his usual gyrations, evidently greatly delighted at the prospect, and followed him to the bedside of his master. There he took his position, first looking at the doctor and then at the sick man, as if quite aware something was wrong. As things moved lively he was on the alert, but when all was quiet and dull he remained much the same. This state of affairs passed on for some weeks, and the certainly instinctive actions of the little terrier could not but be observed. After a long and trying illness the patient passed away. Some days afterwards, the family physician called to pay a friendly visit. The dog was there, but much changed in character. No longer active and energetic as formerly but rather quiet and indifferent, he took his position on a rug near at hand and turned his back on the visitors, evidently not wishing to attract attention, as his chief source of pleasure was gone, and the familiar voice was hushed forever. The actions of these little animals, so strange and peculiar, are evidence of mental power, difficult to define and sufficient to make us cherish their actions, indicative of rare attachments and canine sympathy.

MEETING OF THE ENTOMOLOGICAL BRANCH.

Meeting No. 19, held at Mr. Gibson's rooms on January 19th, 1905; nine present. The chair was taken by Mr. Arthur Gibson, who stated that the proceedings this year would be of the same nature as heretofore, viz., that each member would be called on in turn, and he trusted that all would endeavor to bring something to exhibit, or some note to read at each meeting of the Branch. In the past this plan had proved so successful that he considered it probably the best way of keeping up the interest. Every actually observed fact was of value, however simple and unimportant it might seem to the observer who made it. Accordingly he called upon every one present in turn and a most instructive evening was passed.

Mr. W. Metcalfe showed a collection of about 100 specimens of all orders which had been collected by him when carrying on his own investigations among the small Heteroptera. His material in his own specialty was not yet sufficiently in order to bring before the Branch, and he asked Dr. Fletcher to speak of any of the specimens in the other orders which seemed worthy of mention. Several rare specimens of flies, beetles and sawflies were then exhibited and short statements made concerning each.

Mr. Norman Criddle, one of our members, from Aweme, Man., described the physical nature of that part of Manitoba where he lived and pointed out the exceptionally suitable character of the locality for collecting insects and plants. He also showed an interesting series of Tiger beetles taken on the drifting sand of an extensive tract of sand hills lying south of Douglas on the C.P.R., and about 12 miles east of Aweme. These specimens included the beautiful local variety of *Cicindela formosa*, which has received the varietal name of *Manitoba*, Leng ; *C. venusta*, *C. purpurea*, var. *limbalis*, *C. punctulata*, and the two very interesting sand-loving species *C. lepida* and *C. limbata*. These two latter are extremely rare in collections, being found on the sea coast and on similar sandy tracts to the one above mentioned, in Kansas and Nebraska. Other striking insects shown by Mr. Criddle were a curious rove beetle named *Xenodusa montana*, var. *hirsuta*, which lives in nests of ants ; a large and strong ground beetle, *Pasimachus elongatus*,

and a specimen of the Rocky Mountain Locust, *Melanoplus spretus*, which occasionally has done harm in Manitoba and the North-west, but which has not been seen for a year or two.

Mr. C. H. Young showed a most exquisite collection of microlepidoptera (about three hundred specimens) which had been taken during the past summer at Meach Lake, Que., and around Ottawa. All the members present were delighted with the beautiful and neat way in which these specimens were set and labelled. Many of the specimens had been reared by Mr. Young from larvæ, and records kept of their food plants.

Mr. W. J. Wilson submitted an interesting small collection of insects taken on the Hudson Bay slope during the past season. He stated that the season had been an exceptionally poor one for all kinds of insects, except perhaps for mosquitoes.

Mr. Andrew Halkett read some interesting notes made in the Arctic regions as Naturalist of the Neptune Expedition, under Mr. A. P. Low. The large larvæ of the Bot Fly of the Cariboo were shown, and a description was given of the way in which these repulsive creatures occur in the backs of the cariboo. They are oval in shape, over an inch in length and about half an inch in width. The body is covered with short spines, and the creatures must be the cause of great suffering to the animals while they are present beneath the skin. When mature they force their way out through a hole in the skin, in a similar way to the warbles seen on the backs of cattle, and fall to the ground. Later, the mature fly, *Œdemogena tarandi*, L., appears. It is a hairy fly three-quarters of an inch in length, of a yellowish colour, bearing a black band across the middle of the thorax, connecting the bases of the wings. The abdomen is yellow at base but has two-thirds at the tip reddish-brown. This insect Mr. Halkett spoke of as the "Tooktoo Fly," which he named from the Esquimaux word for the cariboo. Parasites from the walrus and seal were also shown, as well as some beetles and caddice flies.

Mr. D. A. Campbell showed some eggs, and larvæ in the first stage, of the Cecropia moth, pointing out that the piliferous tubercles were of a different nature in the different stages.

Mr. J. W. Baldwin showed a series of the Meadow Brown butterfly (*Satyrus nephele*), which illustrated the exceeding vari-

ability of markings in this species. A bottle containing living specimens of small ground beetles which he had collected in the autumn and had kept alive through the winter was also exhibited.

Dr. Fletcher showed specimens of two imported cockroaches, *Panchlora viridis*, a beautiful apple-green species, which had been found at several places in Canada during the past season. Specimens had been taken by Mr. C. Stevenson, in Montreal, by Mr. Baldwin in Ottawa, by Miss Dorothy Coates in Winnipeg, and by Mr. J. W. Cockle at Kalso, B.C. The species is a native of the West Indies, and had, probably, in all instances, been imported in bunches of bananas. Another large species found by Mr. C. Stevenson, in Montreal, *Periplaneta australasiæ*, has also lately turned up in numbers in Philadelphia. An extract was read from a letter by Dr. Henry Skinner, just received, in which he quotes from a correspondent, as follows : "I had a lot of living insects sent me yesterday. They are in the greenhouse of one of the members of the Pennsylvania Horticultural Society, and are devouring everything from an orchid to an overcoat." Some remarkable oak galls from California gave an opportunity for speaking of the work of these insects. Specimens of the Brown-tail moth from Massachusetts were shown in all stages of the insect. A single specimen of this moth was taken in St. John, N.B., in 1902, by Mr. W. McIntosh, but no further occurrence in Canada has been reported. It is now causing great concern by its rapid increase in Massachusetts.

Mr. Arthur Gibson showed specimens and spoke on the cosmopolitan occurrence of the granary weevils. The best remedies for preventing injury and destroying the beetles in infested grain were described. The Columbine borer (*Papaipema purpurifascia*) in all stages was shown, and an account given of injury done by the larvæ in beds of columbine at the Experimental Farm. Some well-made inflates of the larvæ of some sphinx moths were also shown by Mr. Gibson and were much admired by all present.

The Chairman drew the attention of the members to the beautiful report by Prof. E. P. Felt, State Entomologist of New York, recently issued on the Mosquitoes or Culicidæ of New York State.

J. F., for Sec.

BOTANICAL BRANCH.

The second meeting of the Botanical Branch was held at the residence of Mr. J. M. Macoun, Thursday evening, Nov. 18th, when the following members were present: Messrs. Fletcher, Attwood, John Macoun, Blackadar, Edward Cameron, Roy Cameron, R. B. Whyte, W. T. Macoun, T. E. Clarke, Carter, St. Jacques, Clarke, Ami and J. M. Macoun.

The discussion on "Individuality in Plants" was resumed and a letter was read from Prof. D. F. MacDougal, of the New York Botanical Garden, in which he stated that certain points connected with mutants and hybrids seem to be well established. These are:

"1. No systematist who has seriously examined the mutants of Lamarck's evening primrose, in the adult stage, has decided them to be otherwise than species and varieties in accordance with the estimate placed upon them by de Vries.

"2. Lamarck's evening primrose does not vary widely, not so widely as some of the mutants, as has been found by statistical methods. The mutants do not intergrade with each other or with the parental form as shown by series of measurements.

"3. The common evening primrose does not vary as widely as it is reputed to do, as has been found by cultural studies: doubtless closely related species have been confused with it, which has led to much misapprehension in the matter.

"4. Mutants have been seen to arise from Lamarck's evening primrose in my own cultures under circumstances that admitted of but one interpretation, and historical investigations show that this species is eligible as research material in every way.

"5. The entire obliteration of the evening primroses and all records concerning them would still leave ample evidence that new qualities arise suddenly or by mutation and that new species owe their origin to changes of this kind. It can not be proven of course that all species arise in this manner, and very probably they do not, as for instance, the species that have been formed by natural hybridizations."

In Prof. MacDougal's paper on "The Origin of Species by Mutation," he cites *Chelidonium laciniatum* as an example of a

species which apparently originated accidentally. He says: "Sprengler, an apothecary in Heidleberg, discovered in his medicinal garden in which *Chelidonium majus* was cultivated a new form of *Chelidonium* with divided leaves and laciniate petals. .... The new species was found to be self-sustaining and in repeated cultural tests has shown no tendency to revert to *C. majus.*"

During the discussion Mr. W. T. Macoun stated that among seeds of *C. laciniatum* received from Upsala and grown at the Experimental Farm, only twenty per cent. had proved to be that species, the remainder being *C. majus.* It is, of course, possible that the seed may have been mixed, but if not, this disposes of *C. laciniatum* as a species. Further tests will be made at the Experimental Farm from their own seed.

One of the members having suggested that the fact that the Early Rose and some other varieties of potatoes no longer ripened seeds was an evidence that these varieties were degenerating, it was brought out in discussion that the reverse was the case. The energy which formerly was required to mature the seed now went to increase the size and number of the tubers. Mr. W. T. Macoun expressed the opinion that if by spraying and watering growing potatoes could be carried past the time when the stalks usually dry up a greatly increased crop would be the result as this would give an opportunity for the small tubers to grow and ripen.

A description of an interesting experiment on the vitality of the common buttercup was given by Dr. Ami, details of which appeared in the December number of THE NATURALIST.

The third of the series of meetings in connection with the Botanical Branch of the Club was held at the residence of Mr. H. M. Ami on the evening of Dec. 6th, 1904. There were present Messrs. John Macoun, W. T. Macoun, R. B. Whyte, A. E. Attwood, D. A. Campbell, T. E. Clarke, H. St. Jacques, and Roy Cameron. Mr. E. Stewart, of the Forestry Branch of the Department of the Interior, and Mr. Hamilton, of the Exhibition Division of the Department of Agriculture, were present as guests.

The topic chosen by the chairman for discussion was "Conifers," and he introduced the subject with a brief paper on "A typical young pine forest growing at Ironsides, near Ottawa,"

where conditions prevail which afford an excellent opportunity for members of the Botanical Branch of the Club to study not only pine-life, but also the growth of trees generally. There are poplars, birches, maple and pine trees, growing together in a young forest which began to sprout after the fire of 1870 which cleared the whole region for miles, and laid bare, owing to erosion of the underlying clay deposits, several thousand acres of land on which not a blade of grass could be seen. The following notes on the forest, which can be seen there at the present time, are herewith given.

"After the big bush-fire of 1870, which swept over a large portion of the Ottawa valley and laid waste large areas of good and bad timber lands, there followed the consequent erosion and denudation of the country. The timber-laden district of Ironsides, between Ottawa and Old Chelsea, had been totally destroyed by fire, leaving on the ground nothing but the bare burnt clay, together with a few large trunks of the gigantic pines of this neighbourhood, which attested to the great destroyer of plant-life and the once thriving forest. Lumber camps had come and gone. Man had cut the best for himself, leaving only the smaller scrub behind, and a few others spared by the axeman.

"Presently, not even the trunks of the trees were seen standing or fallen, throughout the burnt areas, for the erosive agencies soon began their powerful operations, whilst vegetation, which usually acts as a deterrent to the progress of waters from rain in reaching the nearest streams, was no longer there.

"Rain having acted upon the unctuous clay deposits, the fine materials of which it is composed were soon carried down to the lower levels in the nearest brooks, and a clean, bluish-gray clay surface, well-washed and presenting a destitute and barren piece of country followed.

"Not a blade of grass could be seen for miles. This state of affairs continued for a couple of years, during which the waters of the district carved out the strata, and carried off much of the soil and clay of the disrict. Deep valleys were excavated, trunks of trees, and other remains of vegetation, etc., were carried away and buried in the sediments of this period down the Gatineau or Ottawa.

"Nature is always busy, and as soon as there came a slight lull in the process of denudation, she sent forth her redeeming forces and employed them in restoring, reconstructing and maintaining the equilibrium by sowing seeds of various grasses, shrubs, trees and other kinds of plants from this well-known

prolific district, and soon the blue-gray clay mass and tints began to disappear and assume a green appearance. Denudation and reforestration had a struggle. The former had won outright at the outset, but now it was the birth of a new forest, and it was also the turn of plant-life to flourish and spread its beneficent mantle over the land.

"To-day there may be seen in the same district a dense young forest of soft and hard-wood trees, with the usual associates of the forest in the form of shrubs, flowers and grasses, sedges, mosses, etc. The humblest of these are, perhaps, the greatest protectors to our forests. They keep back the rush of the waters in periods of flood and rainstorm. In the Ironsides district to-day we have a young pine forest which is apparently growing to the best advantage for the production of fine pine timber in the not distant future.

"What are the conditions prevailing? Along with the young pines there may be seen growing in luxuriant form, poplar trees (*P. grandidentata*, *P. tremuloides* and *P. balsamifera*), also birches and maple trees, amongst which we have *Acer rubrum*, whose gorgeous tints of autumn time afford such glorious pictures to the view of the city folk from Parliament Hill. As is well known, poplars grow much faster than pine trees. A visit to the locality will show you a young pine-tree practically surrounded by other trees, chiefly poplar. The poplars are taller than the pines, and are likely to maintain their supremacy for some years to come. As long as the poplar-trees keep growing taller, and in the growing period of the year over-top the pines, we find that the lower branches of the pine-trees will be stifled or become more or less abortive, owing to the density of the foliage surrounding the trunk of the pine-tree. By the time that the poplar-tree reaches its maximum height, the branches of the pine-tree will be mere twigs This will give the pine-tree a trunk free from knots, and form merchantable timber of the greatest value. The instant the poplar-tree stops growing taller, the pine-tree in turn shoots upward and out from the mass of foliage below, and soon towers above the poplars till it reaches its maximum height—three or four times that of the poplar. Then the life of the poplar begins to decline, the trunk decays, its branches break and fall, whilst insect-life comes in to accelerate its doom. The pine-tree, in the course of a few years, begins to spread an umbrella-like shade over the dying poplar, to hasten the final crisis, which the winds of summer or storm soon bring about. Then the monarch of the Eastern Canadian forest is king, and rules.

"I imagine that there are few places on this continent where a study of pine-life can be carried on to greater advantage than in our immediate vicinity at Ironsides, Que. I had an opportunity

this fall (September, 1904) of visiting Woodstock, Vermont, where Yale students of forestry have an excellent opportunity to study young forests.

"I have no hesitation in saying that it would be most interesting to have yearly records of the life-history of some of the individual trees of the Ironsides district, in order to ascertain the normal as well as the best conditions which must prevail in order to form fine timber trees, whether pine, spruce or poplar, or even hardwood. Whether it would be advisable to reserve just such a piece of country which thirty-four years ago was as bare of vegetation as a billiard-ball or an egg, is a question which it may be worth while for the Government to consider.

"I have recently heard of a Canadian pine and conifer forest growing in Germany which was seeded sixty years ago and is now flourishing. Baron Fuerstenberg's father it was who planted the seeds of Canadian conifers in Gammertingen, Germany, these long years since, and I have learned that they now have a forest worth while cutting. It would be interesting to ascertain the quality and quantity of lumber that can be cut from these trees.

"I would strongly advise anyone wishing to see a young pine forest, to visit the thick woods of Ironsides, along the line of the Canadian Pacific Railway between Ironsides station and Chelsea, within the 'Ottawa District.'

"H. M. AMI.

"Ottawa, Dec. 6th, 1904."

DISCUSSION.

In the discussion which followed, Mr. W. T. Macoun described the results of the experiments in tree-planting made at the Central Experimental Farm in Ottawa since 1887. Here a forest of the Scotch pine grows well. Several plantations of white pine also had been made in three different ways: five feet apart, ten feet apart, and with mixed trees. He remarked that shade killed pine trees. Prof. Macoun remarked that poplar and birch were the scrub in which pine delighted to grow. Poplars and birches came and died, then the pines and elms survived and flourished. He reiterated a statement made by him before the Forestry Conference in Toronto, in 1903, to the effect that pine trees grew from the seeds which came up out of the ground where the squirrels and other small mammals had stored them. White pine grew from decaying logs for the most part. Mr. Hamilton stated that at the River Désert, up the Gatineau, in 1874, four

years after the big fire, he saw poplars growing, and seventeen years after the pine trees were one foot thick at the stump. He believed that trees flourished best when thickly planted. He had noted the fact that pine trees growing in light soil had lighter colored leaves than those grown in richer and darker loam. Mr. Stewart pointed out that broad-leaved trees and other forest weeds killed smaller pines. Mr. W. T. Macoun further remarked that during an outing last fall with Mr. Elwes, of England, an enthusiastic forester, when a traverse was made from Kingsmere to the Gatineau river, through the forest, they had noticed young pine trees growing almost invariably upon the decaying trunks of fallen trees. He believed that the Scotch pine would thrive in America, and in our Northwest especially would be a welcome grower. Seedlings of the Scotch pine (*Pinus sylvestris*) grown in Canada at the Central Experimental Farm had already been planted. There were three Old Country trees in Canada doing very well, namely, the Scotch pine, the Norway spruce, and the European larch.

Among the specimens exhibited were *P. inops* from the New Jersey barrens, and *P. Tæda* from Georgia.

THE THREE SPRUCES.

Mr. W. T. Macoun then spoke on the three spruces, *Picea rubra*, *P. nigra* and *P. alba*. The first grew in the east only, while the other two grew from Prince Edward Island to the Rockies. Black spruce grew in damp and wet places; white spruce grew best on the margins of swamps or edges of moist land; whilst red spruce grew on farms on high lands. He exhibited specimens of eleven spruces growing at the Central Experimental Farm, amongst which we note: *P. Omorica*, *P. orientalis*, *P. excelsa*, *P. Engelmani*, *P. obovata*, *P. Sitchensis*, *P. pungens*, *P. Alcockiana*, besides fine examples of the three Canadian spruces, black, white and red. Mr. Macoun pointed out the differences which existed between the various species shown, as well as their resemblances.

Prof. Macoun pointed out, and Mr. Stewart supported him in the view, that the black spruce (so-called) of commerce in New

Brunswick was *red* spruce proper (*P. rubra*). Mr. Stewart enquired if it was known that black spruce grew any merchantable size anywhere. No one had ever heard of black spruce making merhantable wood.

Prof. Macoun had collected the three spruces at Eastman's Springs, near the Mer Bleue. In the latter bog the black spruce was common. He had noted a *law* in the fruiting of spruces, namely, that white spruce always had the top cones on the tips of the branches hanging down; red spruce had them half-way down; whilst black spruce had its cones close to the trunk, and these stay on for ten years, and even over twenty years. White spruce lose their cones soonest, red next. You will generally find the cones of the white spruce tree on the ground. Pollination in spruces was also discussed by Prof. Macoun. He stated that whereas the tops of spruce trees were often crowded with cones, as much as a bushel at the very top, the lower limbs of the tree were covered with pollen.

Regarding the character of colour of the wood of the spruces, it was noted that the wood of the white spruce was white, that of the black spruce more resinous and hence darker, while the colour of the wood of the red spruce was very near that of the black, hence the term "black spruce" given to red spruce in New Brunswick and elsewhere. In the discussion, Messrs. Campbell, Clarke, Attwood and others took part. Through the kindness of Prof. D. P. Penhallow, of the Botanical Laboratory of McGill University, Montreal, Mr. Ami was able to show, with the aid of the microscope, thin sections of the three spruces discussed durigg the evening. Microscopical sections revealed the structure of wood beautifully, and marked differences were observed. The microscopical test was always crucial and proved most satisfactory.

WHAT IS NATURE STUDY?

Putting the definition of the Nature Study movement in one concrete sentence, I should state it as follows: "The Nature Study movement is the outgrowth of an effort to put the child into contact and sympathy with its own life."

L. H. BAILEY, Ithaca, N.Y.

NATURE STUDY—No. XXI.

NATURE STUDY IN THE SCHOOLS OF NOVA SCOTIA.

(A Historical Sketch.)

By DR. A. H. MACKAY, Superintendent of Education for Nova Scotia, Halifax, N.S.

A systematic course of oral and objective study was outlined in the first conspectus of a course for the schools of the province, which was presented to the Provincial Educational Association at Truro on the 14th day of July, 1880, by the Principal at that time of the public schools and Academy at Pictou. This was done on the invitation of Dr. David Allison, then Superintendent of Education for the province. After due discussion the conspectus was referred to a committee for simplification and presentation at the convention held the next year, where it was further discussed and passed, practically in the form in which it was soon after prescribed by the Council of Public Instruction for the first eight grades of the public school system, known as the common school grades, in the year 1881.

In 1887 "The Educational Review," which has ever since been continuously published at St. John, N.B., was started with the object of developing the Nature Study side of the course, as well as serving incidentally as a teachers' organ for the Atlantic provinces of Canada. Illustrated lessons on natural objects were prepared, the most continuous being the series under the title "Ferndale School." The whole environment of common school life was more or less covered, instruction for teachers on various subjects, including even the evening sky, which was illustrated by a series of star maps. The Ferndale series dealt with the biological side mainly; but other pages covered mineralogy, physical phenomena of common range, and so forth, before any general effort appears to have been made in the educational press of the other provinces of Canada.

A little later, 1901, a Science building was erected in connection with the Provincial Normal School; and the Provincial School of Agriculture founded by the Government a few years earlier, was then more completely affiliated with it. An extra course of two years in the sciences underlying the art of agriculture was

given to teachers who could take this extra time, for which a special diploma and prize were awarded, and an additional provincial grant of $100 when they were engaged in teaching in an efficient rural school. This idea has been carried out in a fuller manner by Dr. James W. Robertson, director of the Sir William C. Macdonald Rural School Fund, when $175,000 were donated to build the Macdonald Institute of Nature Study, etc., at Guelph, in Ontario, and additional funds were provided for Nature Study teachers and school garden demonstrations.

For about twenty-four years the idea has been in the public course of study, developing gradually from morphological to biological observation—from the observation of forms to the observation of action. For a number of years records have been made of the biological and meteorological facts capable of being accurately observed by pupils and verified by teachers, such as the dates of first flowering, leafing and fruiting of plants ; the migration of birds ; thunderstorms, frosts, high and low water, etc. These have proven so valuable as scientific records, that for some years they have been annually compiled into averages for the different regions of the province as well as for the whole province. The schedules have to some extent been utilized in the other provinces of Canada, and a similar system has been introduced in imitation of it into some of the schools of Denmark. The main object of the scheme originally was to give some objective work to the pupils on their way to and from school, to be reported to the teacher in school. These schedules are being carefully bound up into annual volumes, for the benefit of future students of climatic and ecological conditions in the province.

In the provincial course of study special directions are given for each of the eight grades ot the common schools. The general directions published in each school register give in brief form the substance of the *special* directions published annually in the "Journal of Education," which is the official bulletin of the Department, sent free twice a year, in April and October, to each school board in the province. These general directions, which indicate the view taken by the Nova Scotia Education Department of the character and importance of this elementary work in the public schools, are as follows :

"NATURE STUDY.—The noting, examination and study of the common and more important natural objects and laws of Nature as they are exemplified within the range of the school section or of the pupils' observation. Under this head, pupils should not be required to memorize notes or facts which they have not, at least to some extent, actually observed or verified for themselves. Many books on the list recommended for school libraries (see October "Journal," 1903) are useful guides to the teacher for portions of the work prescribed in some of the grades. There should be a short "Nature Lesson" given every day on the daily collections and observations of the pupils themselves—not on the statement of teachers or books—the lesson always being based on the objects or observations. These guide books are to be used only to show the teachers how to give such lessons. They are entirely prohibited as text-books for either pupil or teacher, for under no circumstances should 'notes' from the books be given to pupils. All such studies must be from the objects. Observations under this head form some of the best subjects for English composition or drawing exercises in all grades.

"In schools with pupils of several grades under one teacher (as in most rural schools), many of these lessons may profitably engage the whole school. In nearly all, either the whole senior or whole junior divisions of the school can take part. A skilful teacher can thus give profitable object lessons to several grades of scholars at once; at one time giving a Grade V lesson, at another time a Grade VI or Grade VII or Grade VIII lesson, which will also contain enough for the observation and interest of Grade I, Grade II, Grade III and Grade IV pupils. An object lesson given to the highest class can thus, to a certain extent, be made a good object lesson for all the lower classes. The older pupils will see more and think more."

"It must be remembered that the memorizing of notes and facts merely stated to pupils is strictly forbidden under this head. Such memorizing is pure cram, and is injurious instead of being useful. The teacher may not have time to take up in class every object indicated in the Nature lessons of the course. In such cases the pupils should be given two or three objects nearly related to the typical specimen examined in school, with directions to search for

and examine them at home, as illustrated in the specimen class lesson. Without much expenditure of time the teacher can note that this work has been honestly attempted to be done by each pupil. The lessons must be direct from Nature itself, but under the guidance of the teacher, who can save time in bringing the pupils to the point desired by his more matured experience. They are intended to train the observing and inductive faculties, to show the true way of discovering something of the nature of the world which immediately surrounds us and which is and will continue to be reacting upon us in one manner or another. This knowledge is so much power over Nature, from which we have to win our material existence. It is also essential as an element in any true and useful system of philosophy.

"More stress has been laid here on the natural history of each section than on elementary physics and chemistry. Not because physical phenomena are less important; but because the the elements of these sciences are the same all the world over, and there is no end to the cheap and well illustrated guides to practical work in them which will well suit a section in Nova Scotia as well as one in England or in the United States. But there are no such simple guides in the biology of each section, nor in many others of its scientific characters. The teacher, then, must become a student and master himself; for such exercises have special power in developing the habit of accurate observation (which is the soundest basis for any career, ranging from that of the poet and professional man to the tiller and lord of the soil, the tradesman, the manufacturer, the inventor) and in developing in connection with history and civics an intelligent attachment to both the material and ideal features of our country."

These quotations are from the official instructions published annually for a number of years. They will in future be still further modified, it may be assumed, so as to utilize the ideas and principles now being developed in so many countries, many of which have been so effectively set forth in THE OTTAWA NATURALIST series of articles.

THE OTTAWA NATURALIST.

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PRESIDENT'S ADDRESS.

W. T. MACOUN.

Members of the Ottawa Field-Naturalists' Club, Ladies and Gentlemen :—

About this time last year we celebrated the 25th anniversary of the organization of the Ottawa Field-Naturalists' Club, and it was with feelings of gratification that many of the original members of the Club came together and told of the work which had been accomplished by the Club during the past twenty-five years. Another year has gone since then and the Club has entered upon its second quarter century ; let us hope that there will be continued progress in the study of Nature in the Ottawa district, and that we shall realize even more than we have done in the past, what a broad field of work there is, and how little is yet known in the wonderful realm of Nature which lies about us. We can, however, look back over the past year's work with some satisfaction and feel that there is still a bright future for the Club. Although planned by last year's Council, the first work of this year was the evening devoted to Practical Demonstrations of How to Collect and Preserve Natural History Specimens, on April 5th, 1904. This proved very successful. The meeting was well attended, the demonstrations were good, and the numerous questions which were asked showed that this was a popular way of teaching Natural History and of interesting people in the study of it. It is expected that this will be repeated, in some respects at least, next spring.

During the spring, summer and autumn three general excursions were held and six sub-excursions. References have been

made to some of these in THE OTTAWA NATURALIST, and fuller particulars regarding them will be given in the Annual Report of the Council. While at these excursions there is not very much new work done, it is felt that their principal value is in the assistance which the leaders of the Club are able to give at these times to those who are beginning the study of Natural Science and to the delightful outing which they afford to those who, perhaps, may be induced by seeing the enthusiasm of others, and the many attractions which the study of Natural History affords, to investigate for themselves, and thus develop a love for such work.

The Botanical Branch of the Club, which last winter held so many successful meetings at the homes of the members, has begun work this winter with much enthusiasm, and those who attend these meetings feel that in no way can Natural History be studied so well as among a small band of enthusiasts, each with his own views on certain questions and eager to give expression to them. The Entomological Branch will shortly resume its meetings also, and it is hoped that the Ornithologists will soon organize.

There has probably never been a more popular, and at the same time a more valuable, volume of THE OTTAWA NATURALIST than that of the current year. There has been a number of bright articles which have attracted the attention of members who do not always read THE NATURALIST carefully. The series of Nature Study articles continues to be of a very high order, and it is hoped that more members of the Club will take advantage of the pages devoted to Nature Study to give expression to their enthusiasm. There must be many members of the Club who are just bubbling over with good things, if they would only present them. The Editor of THE NATURALIST informs me that he finds it very difficult to get material for THE NATURALIST from local members, and if outsiders did not appreciate the advantages of publishing articles in THE NATURALIST he would be very short of material. Let us try and do better in the future. All lovers of Nature should be able to contribute something from personal observation that would be interesting and useful to others.

We invite you to study the Programme of Soirées for this winter. A change has been made this year in the charncter of the

programme, and the meetings will be more informal than they have been for some years. It is believed that greater good will be accomplished by giving more time for general discussion. A glance at the subjects which are to be discussed and the men who will present them is sufficient to show what is in store for the members of the Club this winter.

I desire to express on behalf of the Club our feelings of appreciation for the use of the rooms at the Normal School and for the courtesy shown by Principal White.

It is with feelings of deep regret that we have to record the loss of a member of the Ottawa Field-Naturalists' Club who was always during the last twenty-two years of her lifetime one of the Club's most valued and best friends. I refer to Miss A. M. Harmon, whose sad death startled us not many weeks ago. If there was ever one who felt the thrill which Nature gives at times to those who know and feel her charms, Miss Harmon was one. She was one of the most faithful members of the Club, and attended regularly its excursions, soirées and annual meetings. The members of the Club will miss her kindly face this winter, and I am sure will trust that her love for Nature is expanding in that broader field beyond the grave.

Ladies and gentlemen, members of the Ottawa Field-Naturalists' Club, I anticipate a most enjoyable and profitable series of meetings this winter.

NEW BRITISH COLUMBIAN ROSACEÆ.

By EDW. L. GREENE.

MALUS MACOUNII. Tree, 20 feet high, four inches in diameter: leaves ample, rather thin, oval, mostly obtuse, from slightly to conspicuously 3-lobed, 2 to 3½ inches long, 1½ to 2½ inches wide, sharply serrate, glabrous on both faces even when young: pedicels nearly glabrous and exterior of calyx wholly so, only the inner face of the acutely triangular reflexed lobes tomentulose: corolla, large, white: fruit not seen.

Margin of Chilliwack Lake, B C., 7 and 13 July, Mr. J. M. Macoun. Thoroughly distinct from *M. rivularis* by its broad

obtusish thin glabrous 3-lobed foliage, and equally peculiar pedicels and calyx.

FRAGARIA LATIUSCULA. Low and not slender, the parts rather firm, peduncles 3 to 6 inches high, the leaves nearly as long, both peduncles and petioles villous with spreading hairs : leaflets pale, glaucescent and almost glabrous above, glaucous and pilose-pubescent beneath : leaflets in the largest leaves not very dissimilar, all on uncommonly long petiolules, very broadly cuneate-obovate, 1 to 1¾ inches long and nearly as broad, those of smaller earlier leaves even broader than long, all coarsely, deeply and evenly crenate : calyx-segments quadrate-oblong, very acute, the elliptic bracteoles quite as long : corolla ¾ inch broad, the petals mostly broader than long and overlapping : achenes large, superficial.

Chilliwack Valley, also by Mr. Macoun, 1891; 34,337, 34,338 and 34,339 of the Geological Survey collection.

FRAGARIA RETRORSA. Slender, soft and delicate woodland plant 6 or 8 inches high ; petioles, peduncles and pedicels retrorsely long-villous : leaflets light-green above and with few scattered hairs, underneath pale and glaucescent as well as more hairy, especially along the fine whitish veins, the middle one rather acutely obovate-rhomboidal, 1 or 2 inches long, the laterals similar but oblique, the teeth of all minutely cuspidate-apiculate : calyx-segments almost caudately acuminate : corolla small for plant, about ¾ inch wide; petals round-obovate, not overlapping, dull white, turning red in drying : fruits large, subglobose : achenes superficial.

Collected in the Chilliwack Valley 1901 by Mr. J. M. Macoun and distributed under Geol. Surv. No. 34,336. No. 34,335 may be specifically the same, but in this the pubescence is scanty and scarcely retrorse ; but if habit, foliage and flowers offer here the essential marks of a species, the two numbers must bear the same specific name.

SOME OF THE RARER PLANTS OF WELLINGTON COUNTY, ONT.

Collected by A. B. KLUGH.

AZPHRODIUM BOOTTII. Very rare. One plant only found, in a cedar swamp near Guelph, Ont. June 28, 1903.

ASPLENIUM VIRIDIS. Rare. Moist mossy rocks near Guelph, July 6, 1903.

MUHLENBERGIA SYLVATICA. Common in places along the River Speed, near Guelph.

SPOROBOLUS VAGINÆFLORUS. Abundant along roadsides throughout the southern half of Wellington Co.

ARRHENATHERUM AVENACEUM. Roadsides south of Guelph.

POA ALSODES. Fairly common in woods south of Guelph. This is not the type of *alsodes* but a glabrous-glumed form with few and long branches, thus somewhat approaching *P. debilis*, but distinguished from that species by the very acute flowering glumes and the longer and broader leaves.

PUCCINELLIA DISTANS. Along roadsides south of Guelph.

AGROPYRUM CANINUM. Common in some thickets south of Guelph.

ARETHUSA BULBOSA. Fairly common in an open bog south of Guelph.

ORCHIS ROTUNDIFOLIA. Frequent in a bog south of Guelph.

HABENARIA TRIDENTATA. Frequent in an open bog south of Guelph.

HABENARIA LACERA. Common in an open bog south of Guelph.

SALIX AMYGDALOIDES. Very common in Wellington Co. and wherever I have been in southern and south-central Ontario. In the southern portion of Wellington Co. it outnumbers *S. nigra* twenty to one. Usually passed over for *S. nigra*, but easily distinguished by the leaves being glaucous beneath instead of bright green as in *S. nigra*.

SALIX SERISSIMA. Fern. Rather scarce in southern Welling-

ton. A very distinct species (*Rhodora*, Jan., 1904) recently separated from *S. lucida* by Dr. Fernald. The capsules of this species do not dehisce until late in October or the beginning of November, while those of *S. lucida* do so in June.

SALIX PURPUREA. Rare. A shrub near Puslinck Lake, in the south of the county.

SALIX SERICEA. Our most abundant willow.

SALIX PETIOLARIS. Scarce.

NYMPHÆA RENIFORMIS. Common in Puslinch Lake.

ADLUMIA CIRRHOSA. Scarce. Rockwood, Ont.

LEPIDIUM CAMPESTRE. Scarce.

LEPIDIUM INTERMEDIUM. Our common *Lepidium*. I have not yet found *Virginicum* here.

BARBAREA VULGARIS. Scarce.

ALYSSUM CALYCINUM. Common along roadsides south of Guelph.

AMELANCHIER CANADENSIS ROTUNDIFOLIA. Common at Puslinch Lake.

PHUS VENENATA. Rare at Puslinch Lake.

VICIA TETRASPERMA. Along the C. P. R. track near Killean, Ont.

VIOLA SELKIRKII. Rare.

LYTHRUM SALICARIA. Rare. At the west end of Guelph by the roadside.

CONIOSELINUM CANADENSE. Common in bogs and damp ground in the south of the county.

ANGELICA ATROPURPUREA. Common near Guelph and eastward in the county.

MONOTROPA HYPOPITYS. Scarce at Puslinch Lake.

MONARDA DIDYMA. Common along the Speed west of Guelph.

VERBENA STRICTA. Rare at Puslinch Lake.

VIBURNUM CASSINOIDES. Scarce.

LONICERA OBLONGIFOLIA. Rare at Puslinch Lake.

LACTUCA HIRSUTA Common at Puslinch Lake.

AMBROSIA TRIFIDA.—In a yard in Guelph.

SOLIDAGO PATULA. Verv common at Puslinch Lake.

SOLIDAGO NEGLECTA. Very common at Puslinch Lake.

BELLIS PERENNIS. Mr. Sunley's lawn, Guelph.

ASTER SAGITTIFOLIUS. Frequent.

POLYMNIA CANADENSIS. In two localities near Guelph.

CARDUUS NUTANS. Common in some pastures and in places along the roadside near Guelph.

MEETINGS OF THE ENTOMOLOGICAL BRANCH.

Meeting No. 20 was held at Dr. Fletcher's rooms on Feb. 2nd, 1905. The chairman, Dr. Fletcher, opened the meeting with an address on the use of Insects in Nature Study, pointing out the difficulties of using and preserving such small and fragile objects. He advocated the examination of specimens out of class and the teaching in class from enlarged charts. He opposed strongly the passing of specimens around an audience while a speaker was delivering an address, on account of the confusion thus caused. Suggestions were made as to species of common insects which would be particularly suitable for study by students, each of whom should have the same insect under consideration at the same time. Insects mentioned were the Clouded Sulphur butterfly (*Colias philodice*) of which eggs could be obtained easily by enclosing a female in a gauze bag over a plant of white clover, planted in a flower pot. Each students could easily provide the food plant and secure the egg laying female. The Camberwell Beauty, the Small Tortoise-shell, the Graptas and Cabbage White butterflies, all of which could be easily obtained and all of which had short life-histories were also recommended.

Mr. D. A. Campbell in discussing the address gave his experience of ten years in teaching natural science and nature study. He had noticed the same difficulty of confusion in the class but believed in making the students examine the specimens very carefully and thought that they did this better when in class at a specified time than outside whenever opportunity arose. Another difficulty

was in finding enough specimens for the whole class to examine at once.

Mr. Arthur Gibson read a paper describing the life-history of *Eupithecia interruptofasciata*, a small geometrid moth which he had reared from larvæ found on *Juniperus communis* by Mr. W. Metcalfe, at Hull, Que. Specimens were exhibited.

Mr. W. Metcalfe described the finding of 42 specimens of *Pachyta rugipennis* which he had taken upon a dead pine tree on May 29 last. The females were ovipositing and every one of these had about half a dozen males in attendance. This is an extremely rare insect and had never previously been recorded from Ottawa A few days afterwards Mr. Metcalfe revisited the tree but could not find a single specimen.

Mr. Jos. Keele gave a most interesting account of an expedition made by him during the past season along the Mayo Lake and in the valley of the Mayo River, Yukon Territory, describing the animals and fishes there observed. Among the insects brought back by Mr. Keele was a beautiful specimen of *Papilio machaon*, var. *aliaska*, and a rubbed but undoubted specimen of *Eurymus boothii*, which answered exactly to a figure of the species published by Mr. H. J. Elwes, in the Transactions of the Entomological Society of London, part III, 1903.

Mr. C. H. Young, exhibited a box of exquisitively mounted geometers taken during the past summer at Meach Lake, Que.

Mr. Andrew Halkett showed specimens of the pupæ of the Tomato Sphinx and casts of some dragonfly nymphs, including *Didymops transversa*.

Mr. J. W. Baldwin referred to insects imported with bananas and showed specimens of cockroaches thus brought to Ottawa.

Mr. Norman Criddle, of Aweme, Man. was present and joined in the discussions.

Meeting No. 21 was held at the residence of Mr. W. Simpson on the 16th Feb., 1905, Mr. Simpson in the chair. The first half hour was pleasantly spent examining the chairman's large collection of local coleoptera, which comprises many rare species. Mr. Simpson, while the cases were being examined and passed around,

drew special attention to the more interesting specimens and gave notes upon their capture.

The advisability of enlarging the Ottawa district for investigation by members of the Entomological Branch was discussed and the general opinion seemed to be that the limits as shown in the Geological Survey Map of Ottawa, of which a large number had been purchased by the Club, were sufficient for present requirements.

Mr. J. W. Baldwin, showed, among other specimens, a beautiful form of *Calloides nobilis*, which he had taken at Ottawa last summer, also some orthoptera and bees.

Mr. Arthur Gibson showed a complete collection of the Ottawa Halisidotas and promised a paper on them for the next meeting.

There was an interesting discussion upon the habits of Gordius and Mermis, and in speaking on this subject Dr. Fletcher mentioned that both were treated of as parasites of locusts in the annual report of the Entomologist and Botanist to the Dominion Experimental Farms, for 1896, at page 238.

Mr. A. Halkett spoke of the parasitic worms to be found in fishes, and referring to imported insects showed a specimen of the large cockroach, *Periplaneta americana*, which had been brought to Ottawa in a bunch of bananas.

Mr. W. Metcalfe showed a collection of Hemiptera many species of which where new to the Ottawa list, and of which he had recently received the names.

Dr. Fletcher exhibited a box of specimens containing many rare and interesting species, among others *Sphinx canadensis*, taken at Ottawa last season at the unusually late date of Aug. 12, also a fine specimen of *Sesia titan*, taken at Sydney, C. B., by Miss Margaret Brown, of Halifax. Specimens of *Termes flavipes* winged and apterous, from Victoria, B.C., were examined with interest by all present.

Mr. Norman Criddle, of Aweme, Man., showed, among other rarities *Pœctes occulatrix*, which he had taken at Aweme on the 20th June last.

Meeting No. 22 was held at Mr. Halkett's house, Mr. Halkett in the chair. The chairman opened the meeting by drawing attention to a neatly mounted collection of conspicuous insects put up on tablets in an original method, which showed the specimens off to great advantage. There were in this collection many specimens which Mr. Halkett had reared from the larva or egg, and concerning which he gave many interesting notes.

Dr. Fletcher showed two cases of insects such as were prepared in the Division of Entomology, for examination by farmers and fruit growers. Each species was represented in all its stages of development together with its work, and parasites. In these cases were such well known pests as the San Jose Scale, the Variegated Cutworm, and other allied species, Tent Caterpillars, Fall Webworm, and White Spotted Tussock Moth. A description was given of the habits of the Black Sand wasp, *Ammophila luctuosa*, and the way in which it hunted for and carried off cutworms and other larvæ. Mr. Geo. Holland and Mr. Norman Criddle, had both studied these insects and Mr. Criddle mentioned that he had seen in Manitoba on one occasion the same or a similar species carrying off a large sphingid caterpillar. Referring to the Tent Caterpillars, Mr. Holland attributed their sudden disappearance to a severe frost in May, which destroyed all the foliage of the trees upon which the recently hatched caterpillars were feeding, and which extended over a vast area in North America. This view was agreed with by most present who recalled the peculiar condensed growth on some trees that year, where the young twigs, of the new growth, had been destroyed by the frost.

Mr. Gibson read a paper which he had promised at the last meeting on the three species of *Halisidota* which are found in the Ottawa district, and gave much information on the habits of the common but handsome caterpillars of these insects.

J. F. for Sec.

BOTANICAL BRANCH.

On January 26th the following members and friends of the Botanical Branch met at the residence of Mr. A. E Attwood : Messrs. J. Fletcher, J. Macoun, R. B. Whyte, W. T. Macoun, T. E. Clarke, J. M. Macoun, D. A. Campbell, R. Cameron, W. C. Ewing, J. C. Spence and Norman Criddle.

The greater part of the evening was spent in considering the obstacles to the successful teaching of Nature Study in city public schools. The following difficulties were pointed out by the leader:

1. Lack of time. The curriculum is already crowded, and public opinion is declaring itself in favor of greater thoroughness in the old staple subjects.

2. Lack of material and appliances for study. As is the case with the other two new subjects, Domestic Science and Manual Training, the work must be done by the pupils individually in a place with the necessary equipments. A Nature Study laboratory is as necessary to the successful teaching of elementary science as is a workshop in the teaching of manual training.

3. Lack of definiteness. An educationist has said that the teacher tolerates the product on account of the process, and that the pupil tolerates the process on account of the product. As things are at present, there is no tangible product for work done by the pupils. Even teachers lack a clear conception of the scope of the subject. Nature Study requires to be defined in a way that will appeal to all.

4. A cause of disorder. The frivolity often observable in a large class of small children during a lesson in Nature Study tends to demoralize the class. The orderly freedom necessary to good work in mutual investigation is a difficult condition in classes of forty or fifty young pupils.

5. Lack of popularity. By actual vote of over 200 pupils, it was ascertained that Nature Study is not liked as well as are the ordinary subjects. Unpopularity of any school subject is due either to its essential unsuitability or to the unattractiveness of its presentation by the teacher. There is little doubt that the latter is the chief cause for the present lack of popularity of Nature Study.

All the teachers present, including Professor Macoun, who taught school for many years, felt the force of the difficulties mentioned; the latter declared it to be his conviction that Nature Study would soon be consigned to the limbo of exploded educational fads. Dr. Fletcher was much more optimistic, and believed that the movement would have a permanent effect on the character of the work done in the schools of the future. Mr. J. M. Macoun thought that a competent supervisor of Nature Study should be appointed. Mr. Whyte expressed himself as thinking that the matter of order in a school-room was unnecessarily emphasized. Mr. W. T. Macoun said that if a clear relation was made to the life of the pupil of the various aspects of Nature Study, there would be no lack of interest in the subject.

The very animated discussion was stopped in time to give the gentlemen an opportunity of examining the wonderfully accurate and exceedingly artistic pictures of plants painted by Mr. Norman Criddle in water colors.

A. E. A.

The Botanical Branch met at the residence of Prof. Macoun, Feb. 9th, when all the members but two were present. A proposition to extend the limits of the "Ottawa District" for botanical purposes was discussed and the general opinion was that such an extension would add to the opportunities for work, as some of the Club's members spend the summer near Ottawa but still outside the present limits. Prof. Macoun drew the attention of the members to the very small cost of making a herbarium collection of plants—only $7 per 1,000 sheets. The mounting paper can be had for $5 per 1,000 sheets, printed labels may be had for $1.50 per 1,000, and another $1 pays for the genus covers.

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